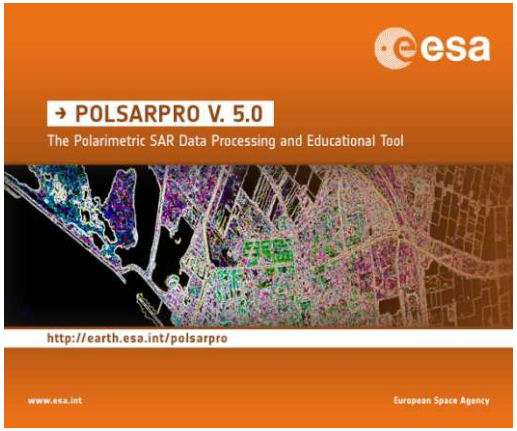
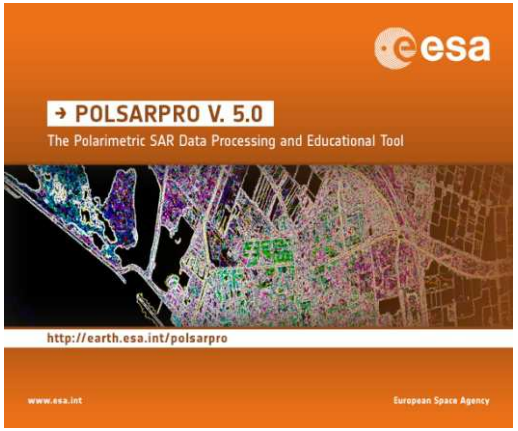
→ 3rd ADVANCED COURSE ON RADAR POLARIMETRY

PolSARpro v5.0

TOOLBOX



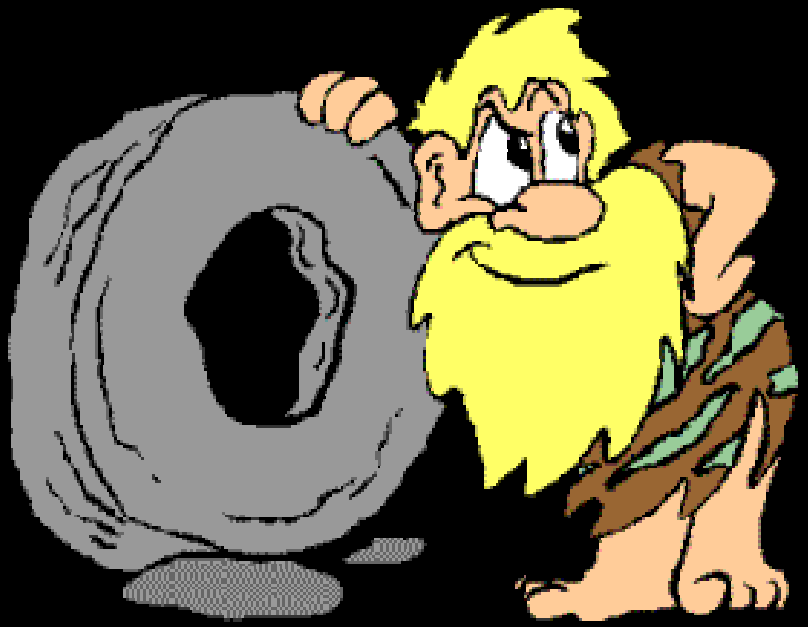
Eric POTTIER



19–23 January 2015 | ESA-ESRIN | Frascati (Rome), Italy

European Space Agency

A Bit Of History



PolSARpro

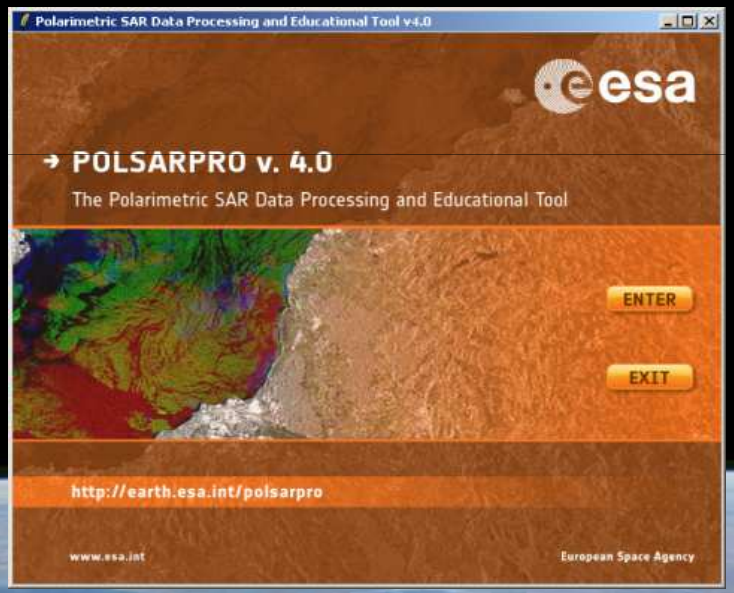
A BIT OF HISTORY

The initiative development of PolSARpro Software is a direct result of recommendations made during the POLinSAR 2003 Workshop held at ESA-ESRIN in January 2003.

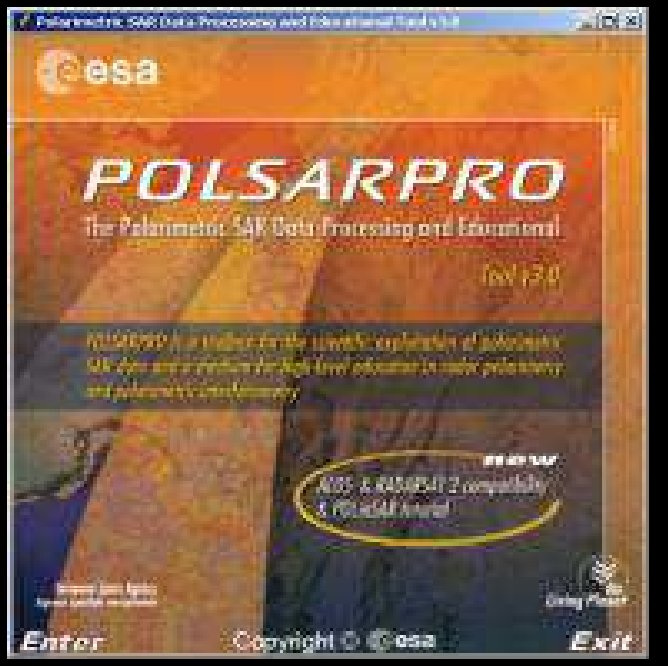
A BIT OF HISTORY

2004

2005



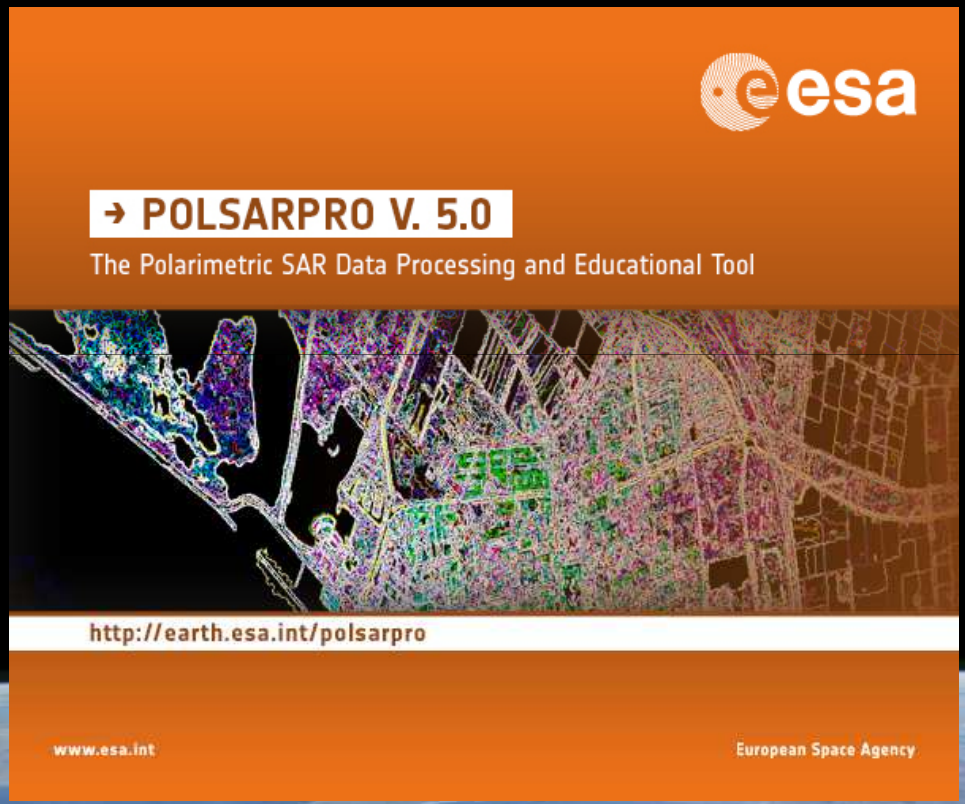
2009 (v4.0) – 2011 (v4.2)



2007

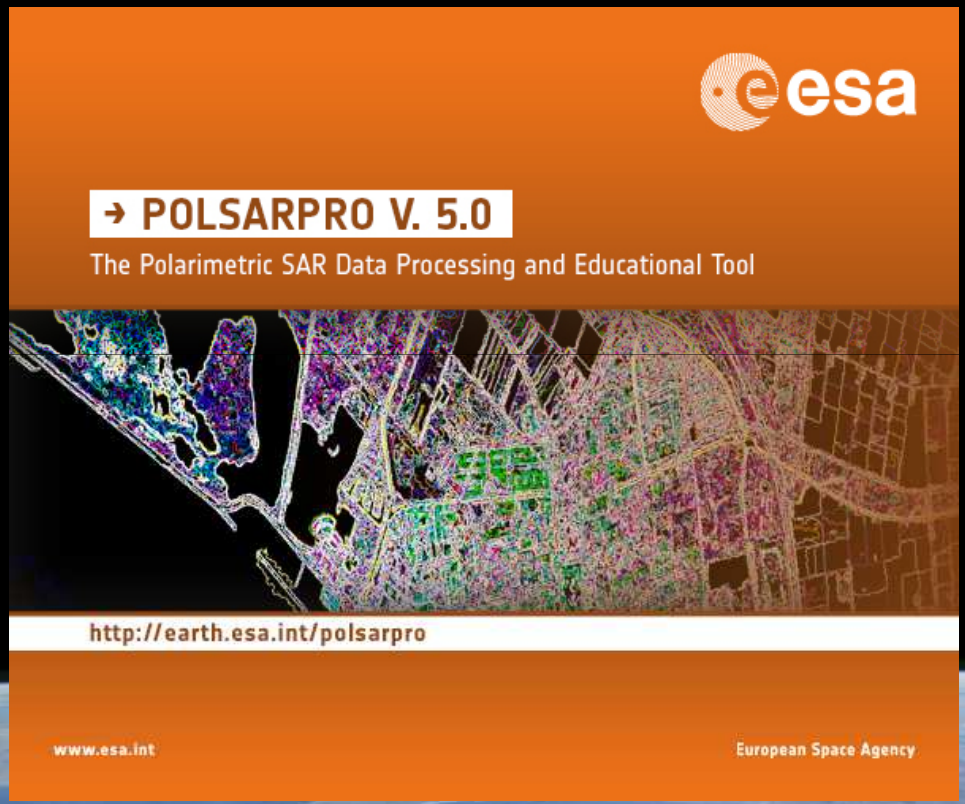
PolSARpro v5.0 SOFTWARE

Tool specifically designed to handle :
Polarimetric data
and
Polarimetric Interferometric data.



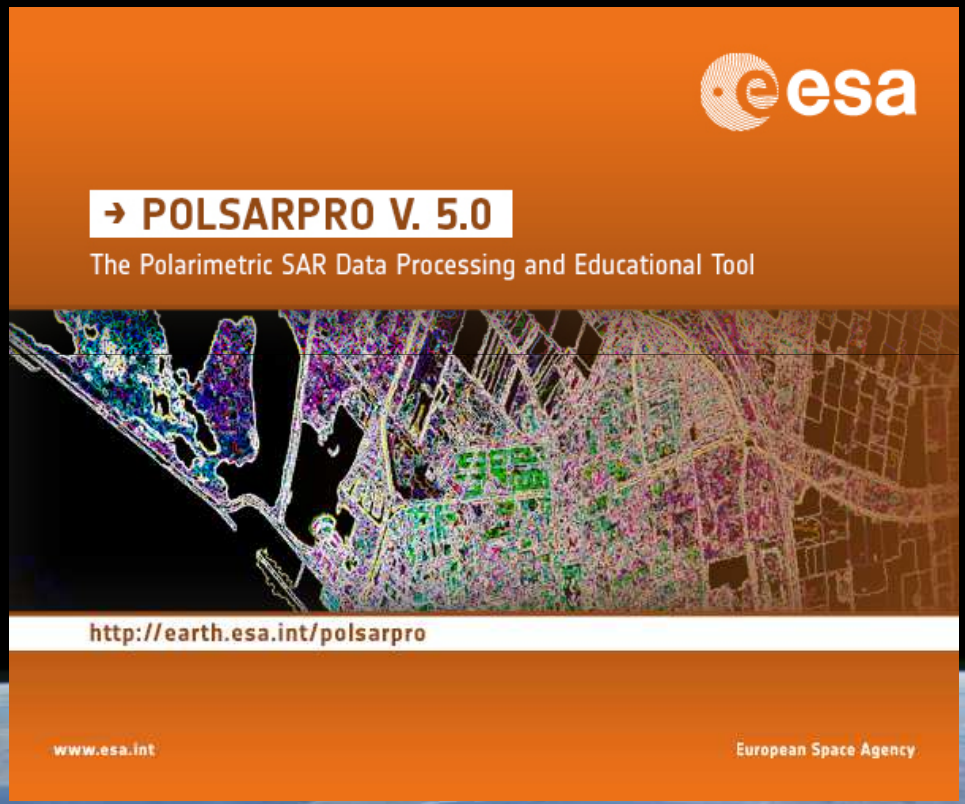
PolSARpro v5.0 SOFTWARE

Educational Software offering a tool for **self-education**
in the field of **POLSAR** and **POL-InSAR**
data processing and analysis.



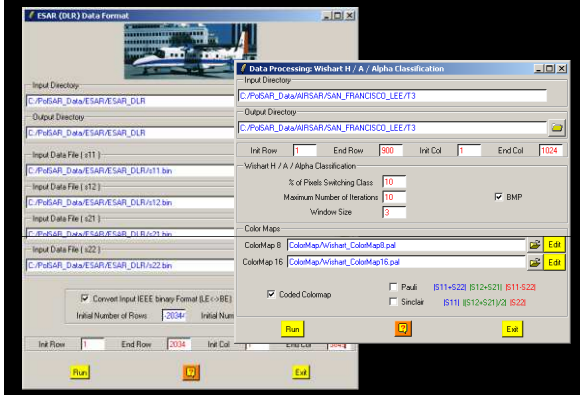
PolSARpro v5.0 SOFTWARE

Developed to be accessible to :
a wide range of users
from novices to experts
in the field of POLSAR and POL-InSAR.

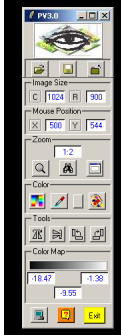


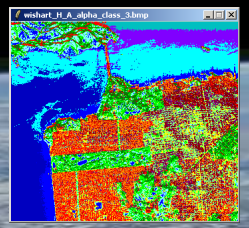
PolSARpro v5.0 SOFTWARE

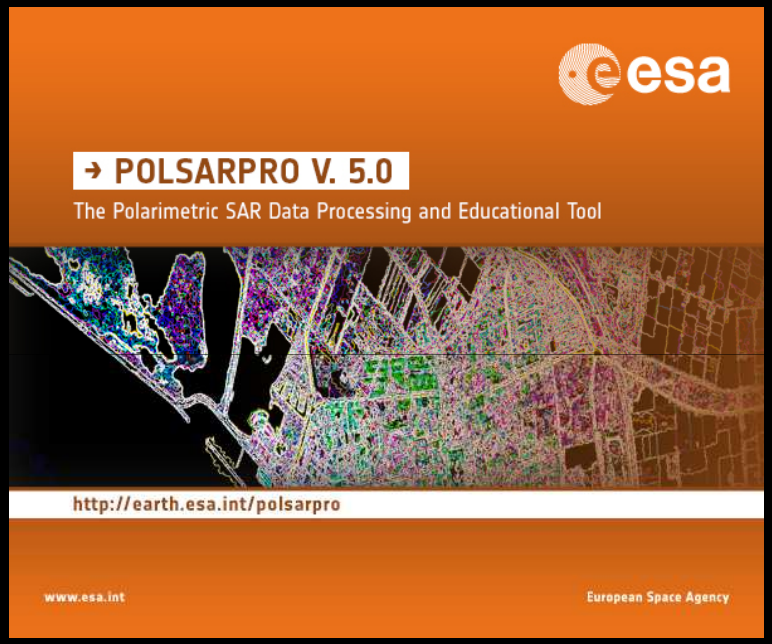
MODULAR STRUCTURE

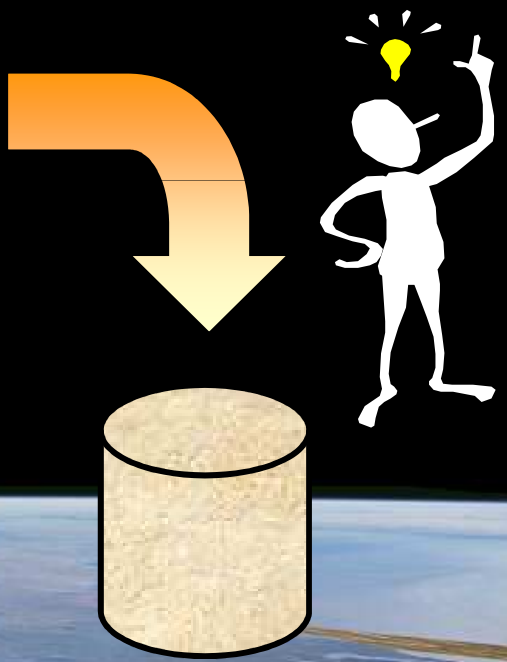


Each element of the Software (a function) can be extracted and incorporated individually into users' own processing software.



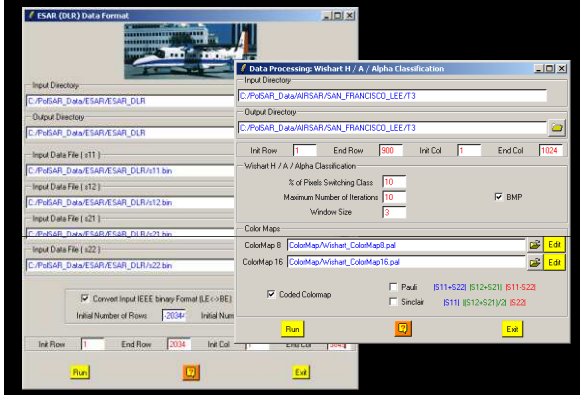


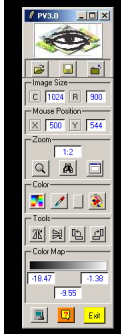


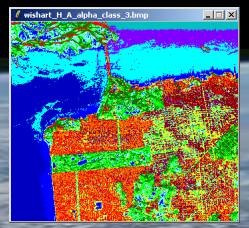


PolSARpro v5.0 SOFTWARE

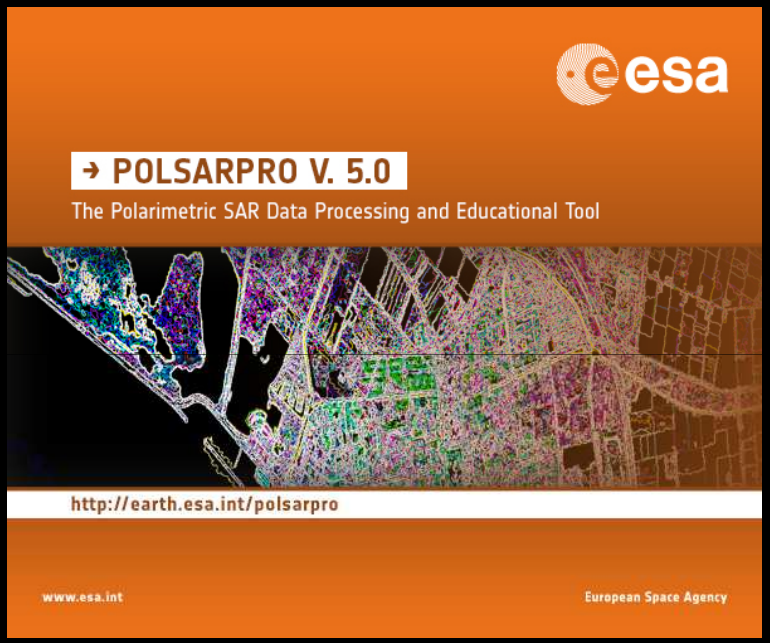
MODULAR STRUCTURE

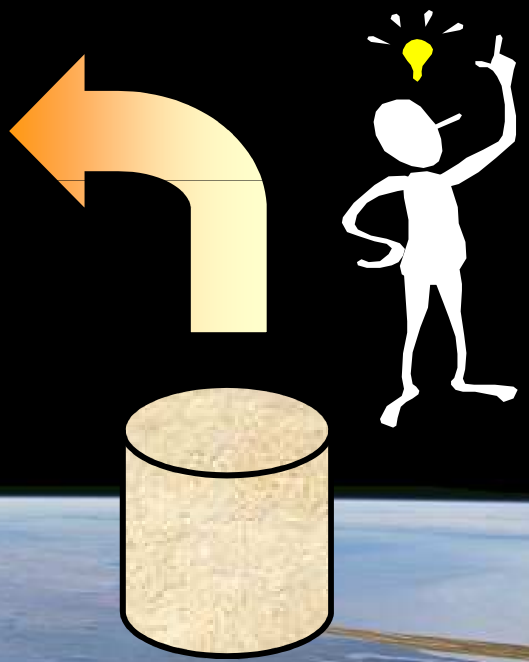




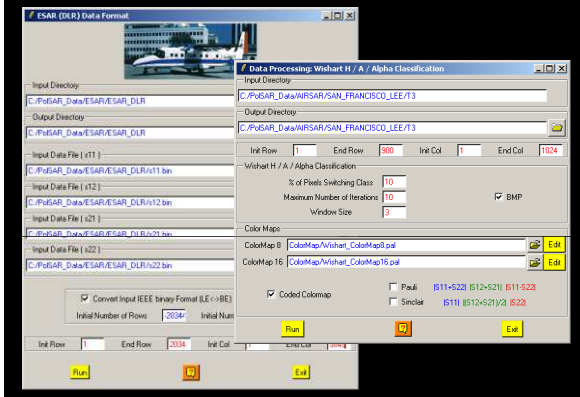


Users can easily **add** their own functions and components, as **PolSARpro v5.0 Software** is conceived as a flexible and open software environment.





PolSARpro v5.0 SOFTWARE



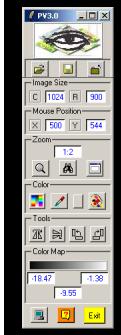
OPEN SOURCE DEVELOPMENT

PolSARpro v5.0 Software is made available following the:

Open Source Software Development (OSSD)

approach, and follows the:

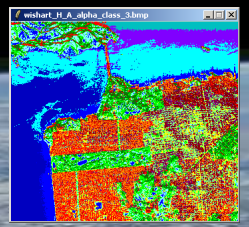
GNU General Public License v2 – June 1991.



PolSARpro v5.0 Software runs today on:

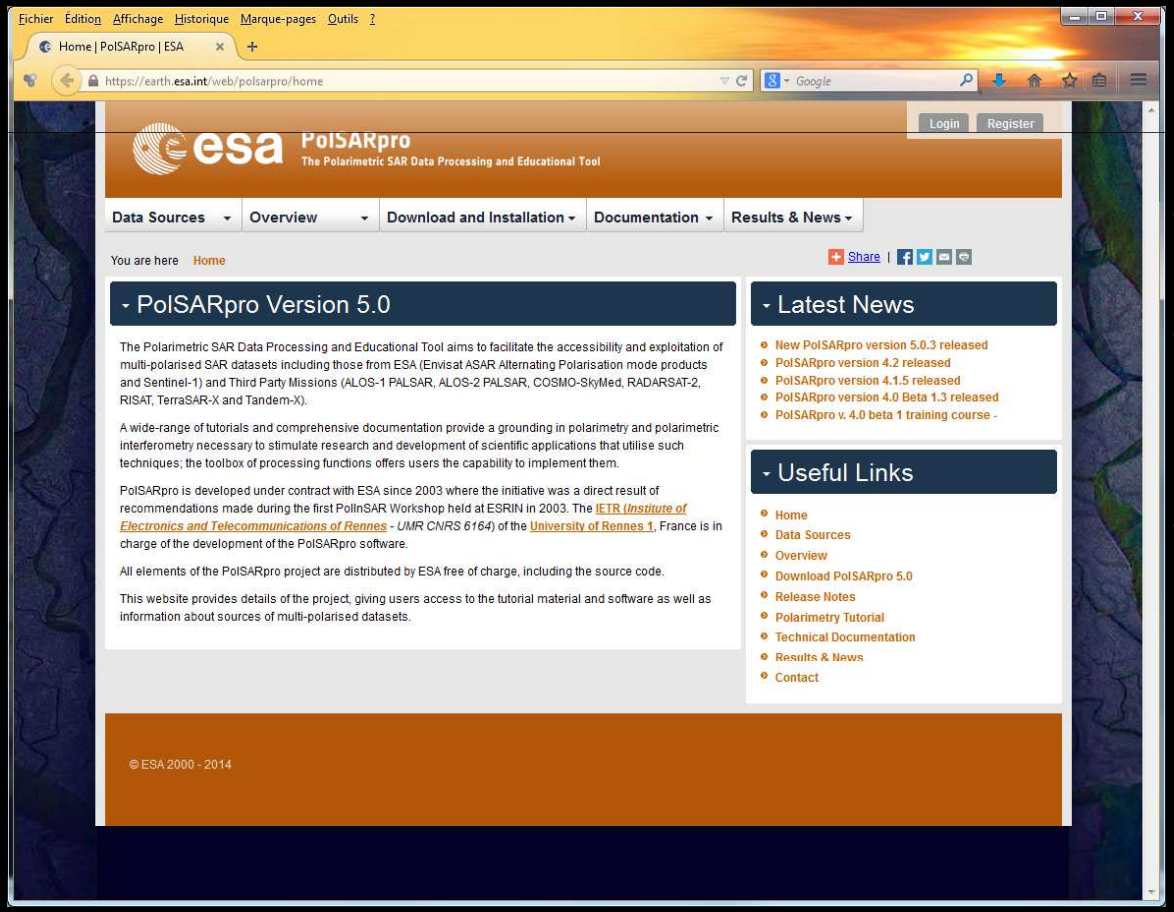
Windows 98+, Windows 2000, Windows NT 4.0, Windows XP, Windows 7 and Linux I386

Macintosh OS:



PolSARpro v5.0 SOFTWARE

http://earth.esa.int/web/polsarpro/home

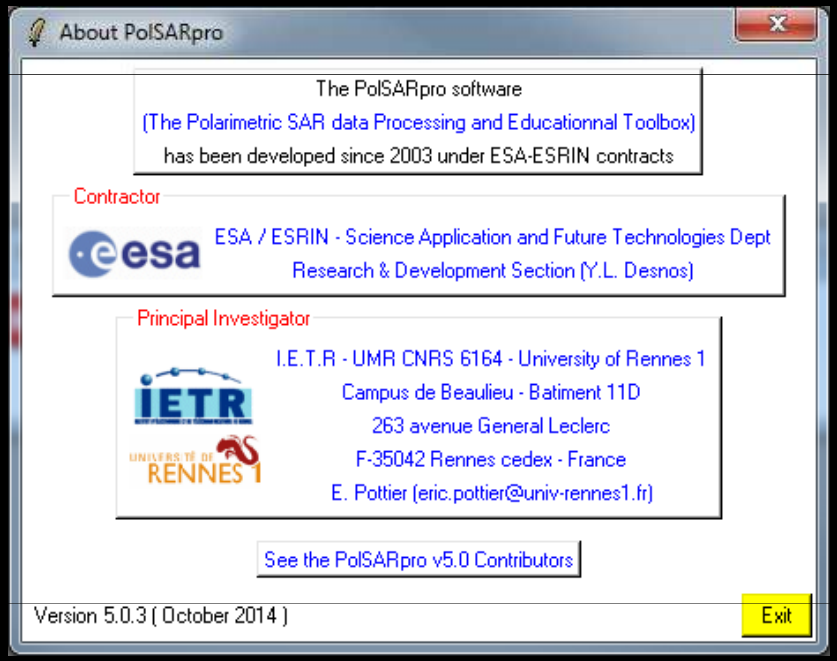


The Web Site provides

- Details of the project
- Access to the tutorial and software
- Information about status of the development
- Demonstration Sample Datasets

New! **v5.0.4 (14/01/2015)**

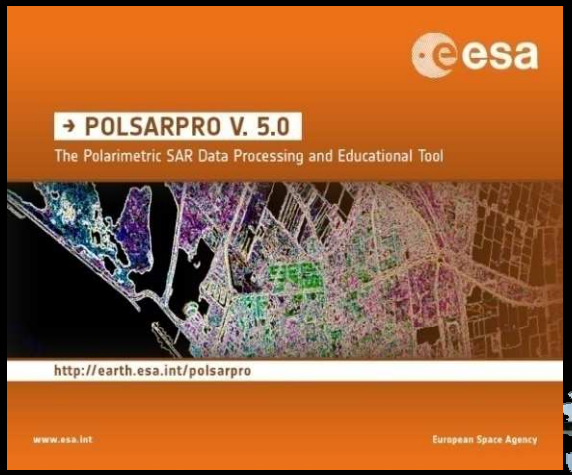
PolSARpro v5.0 Team & Contributors



PolSARpro v5.0 SOFTWARE

Pol-SAR Sensors

PolSARpro v5.0 SOFTWARE



AIRSAR

SETHI

DCRS

EMISAR

PISAR

ESAR

FSAR

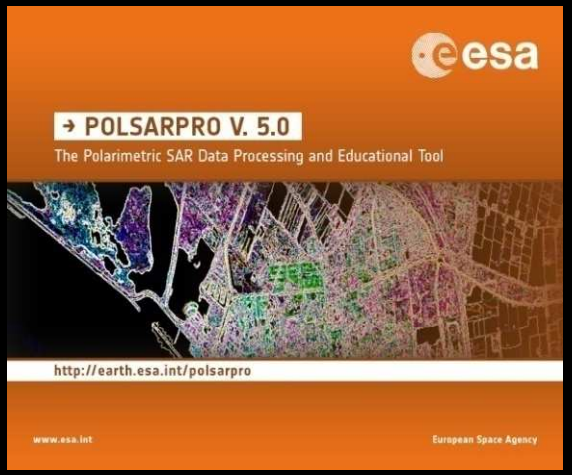
New!

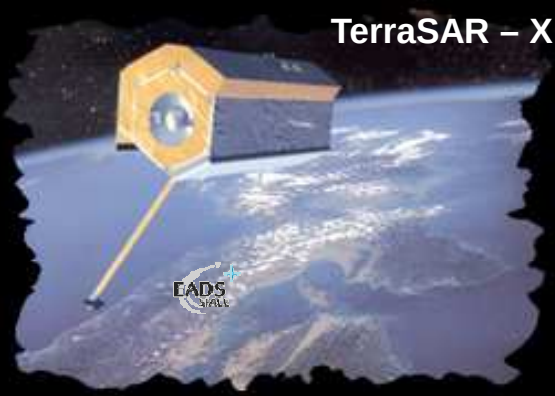
CONVAIR

UAV-SAR

PolSARpro v5.0 Software offers the possibility to handle and convert polarimetric data from a range of well established polarimetric airborne platforms.

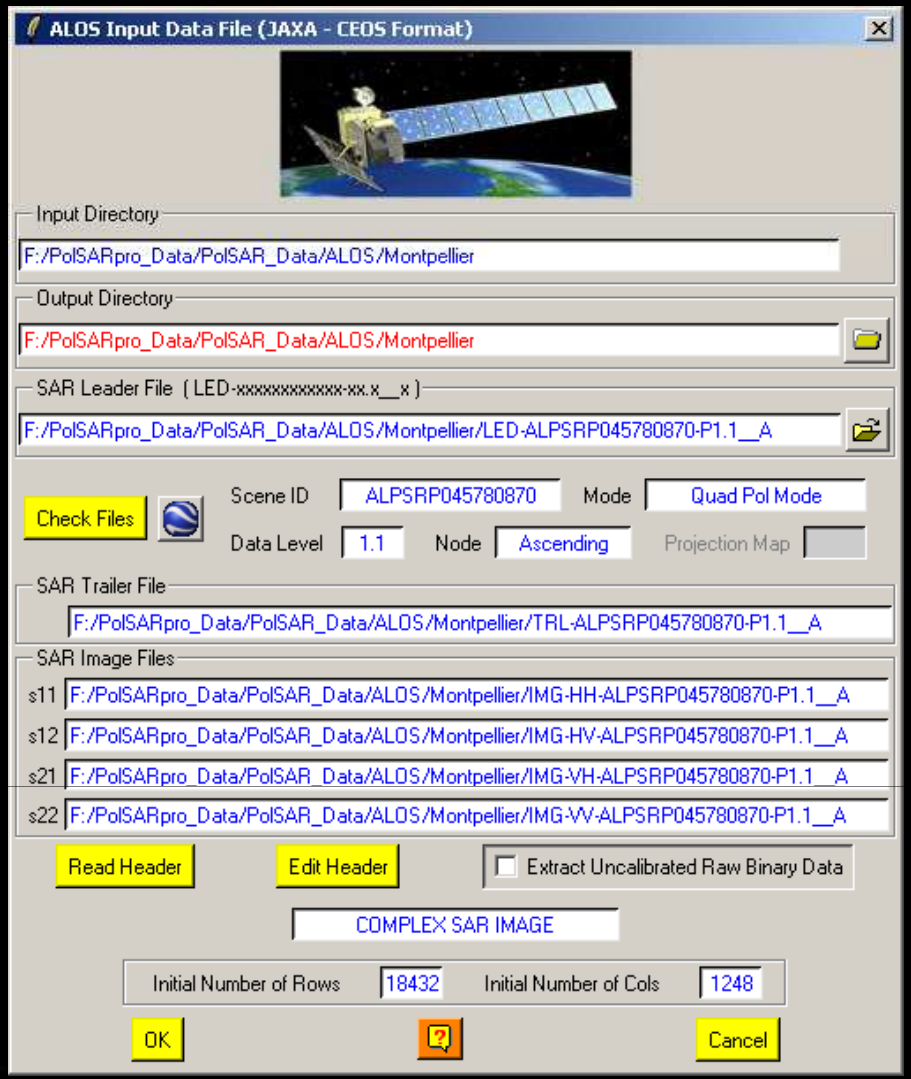
PolSARpro v5.0 SOFTWARE





PolSARpro v5.0 Software offers the possibility to handle and convert polarimetric data from a range of well established polarimetric spaceborne platforms.

PolSARpro v5.0 SOFTWARE



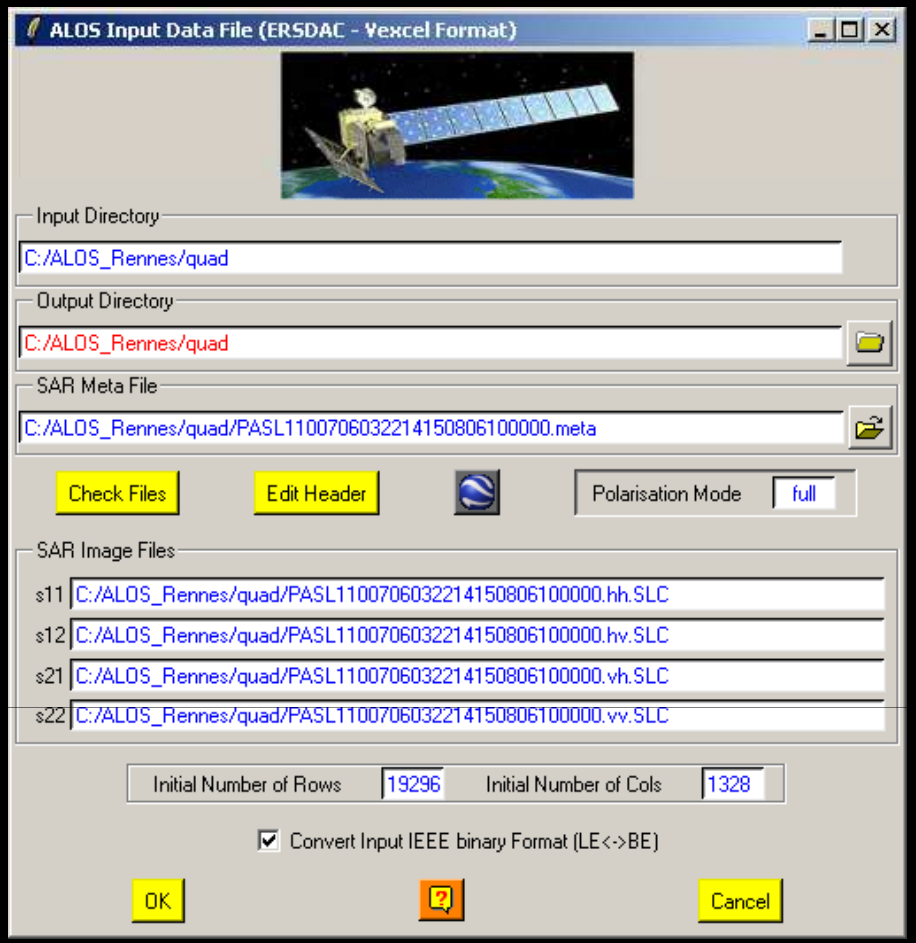
ALOS – PALSAR

ALOS-PALSAR Polar Modes

- PALSAR Dual & Quad POL
- PALSAR Data Level 1.1 and 1.5

JAXA - CEOS Data Format

PolSARpro v5.0 SOFTWARE



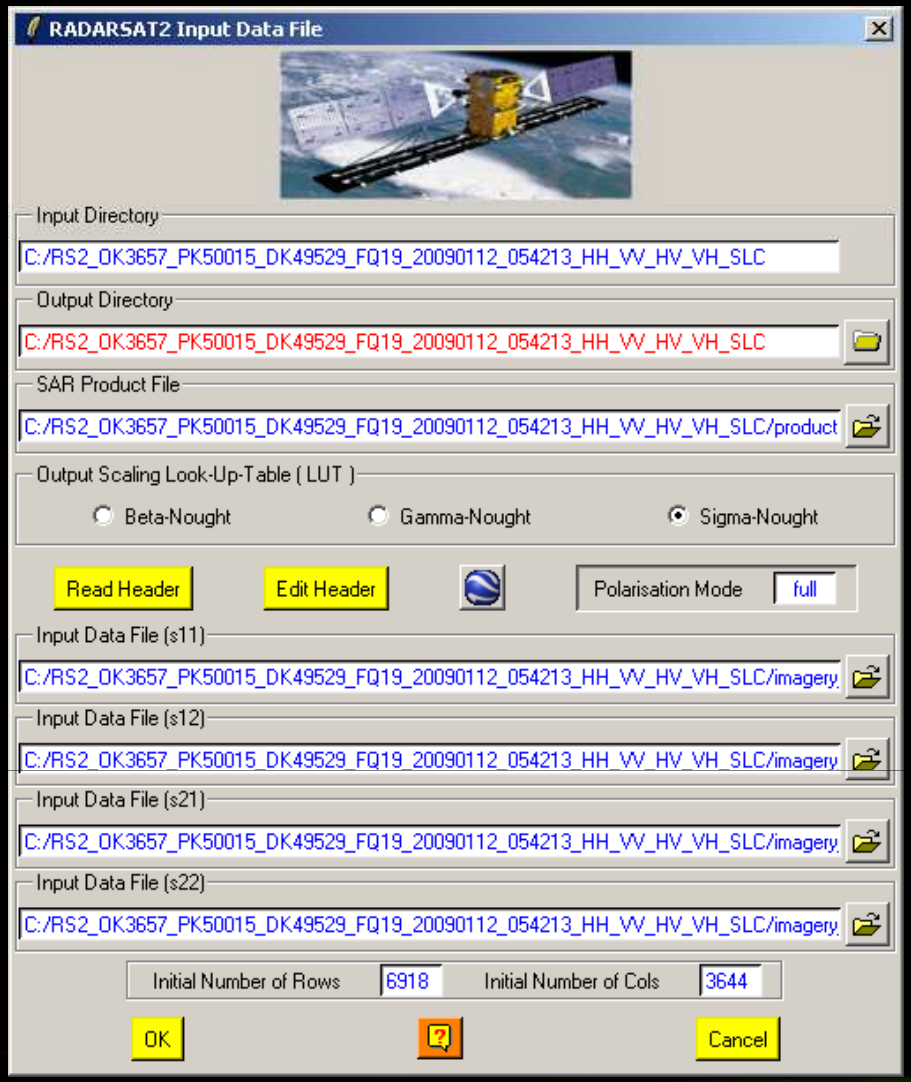
ALOS – PALSAR

ALOS-PALSAR Polar Modes

- PALSAR Dual & Quad POL
- PALSAR Data Level 1.1

ERSDAC - Vexcel Data Format

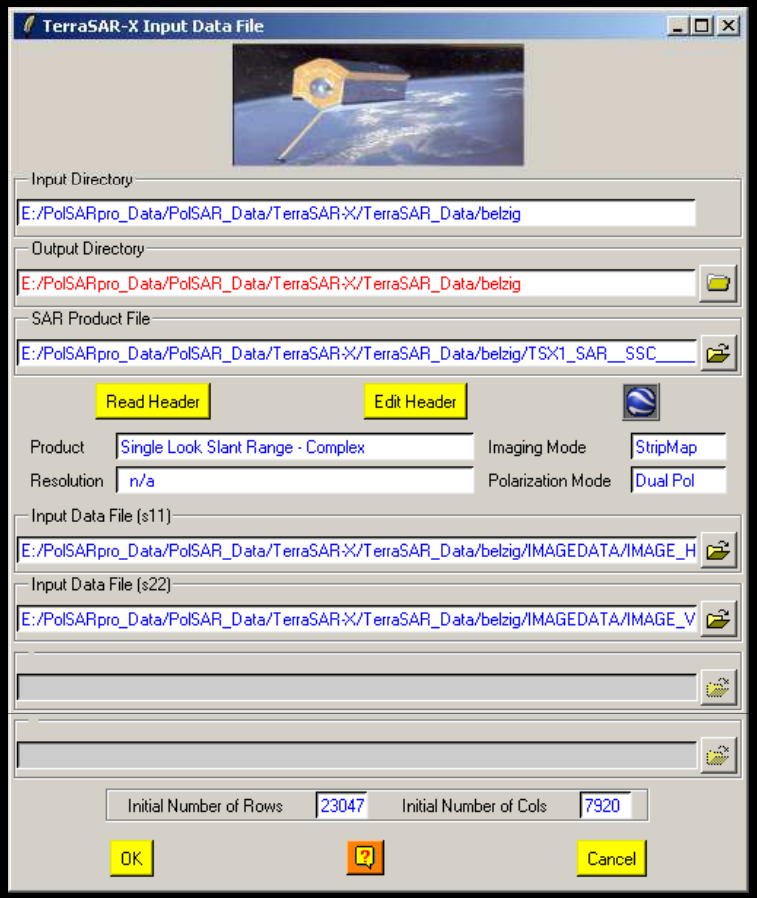
PolSARpro v5.0 SOFTWARE



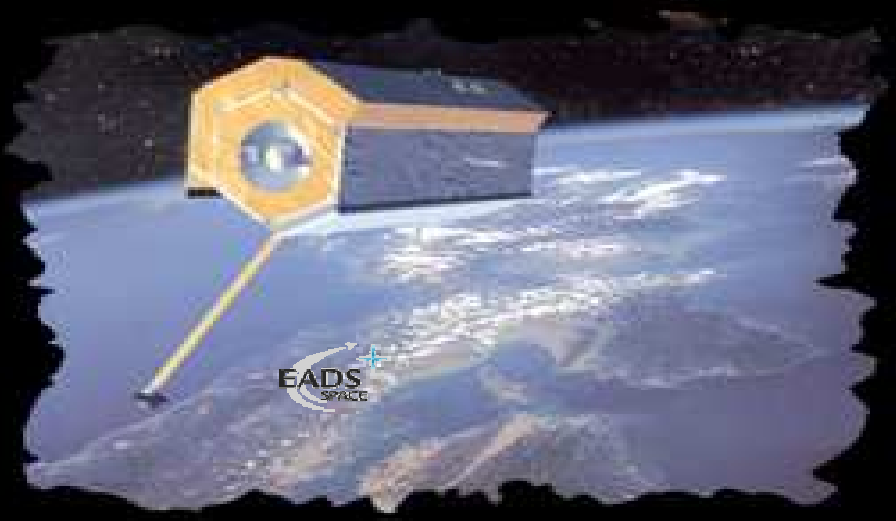
RADARSAT 2

- **Dual & Quad POL**
- **Fine and Standard Mode**

PolSARpro v5.0 SOFTWARE



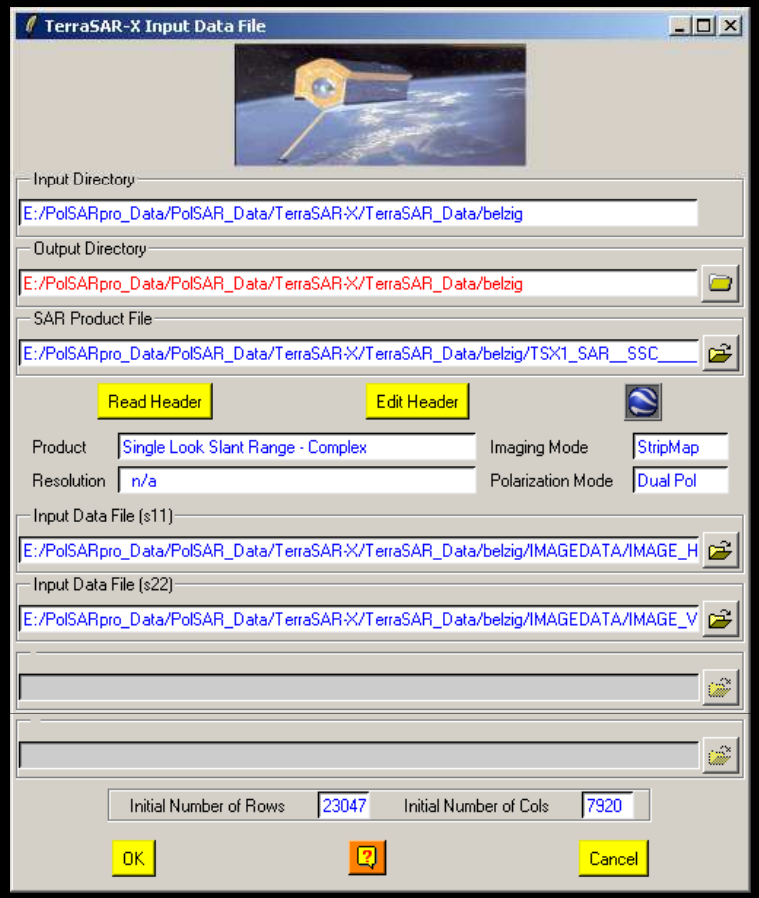
TerraSAR – X



- **TerraSAR – X Dual POL**

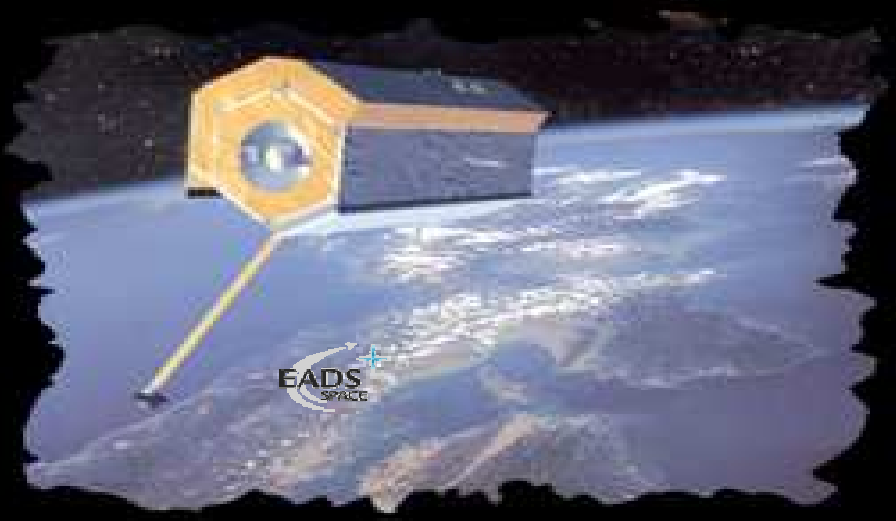
SSC: Single Look Slant Range Complex
EEC: Enhanced Ellipsoid Corrected
GEC: Geocoded Ellipsoid Corrected
MGD: Multi-Look Ground Range

PolSARpro v5.0 SOFTWARE



- **TerraSAR – X Quad POL**

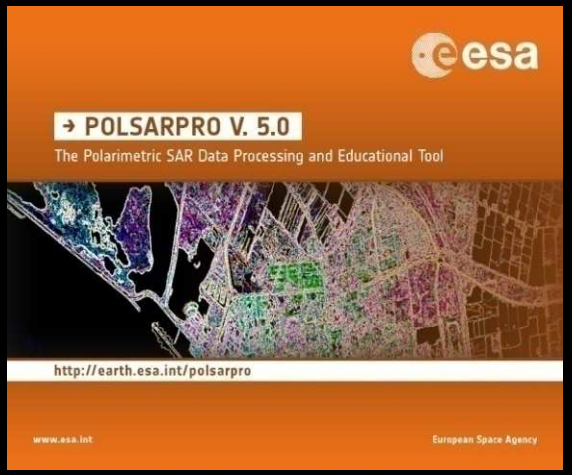
TerraSAR – X



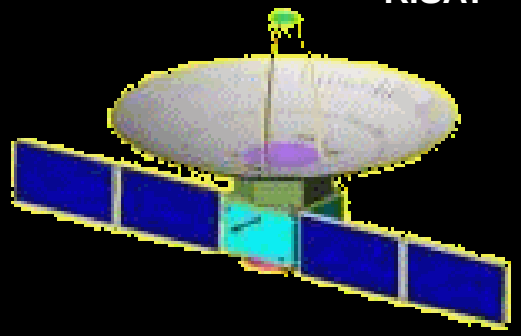
SSC: Single Look Slant Range Complex

PolSARpro v5.0 SOFTWARE

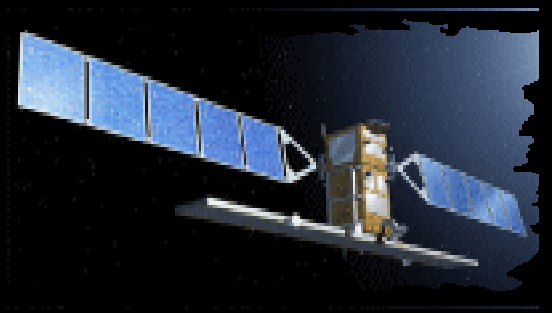
New!



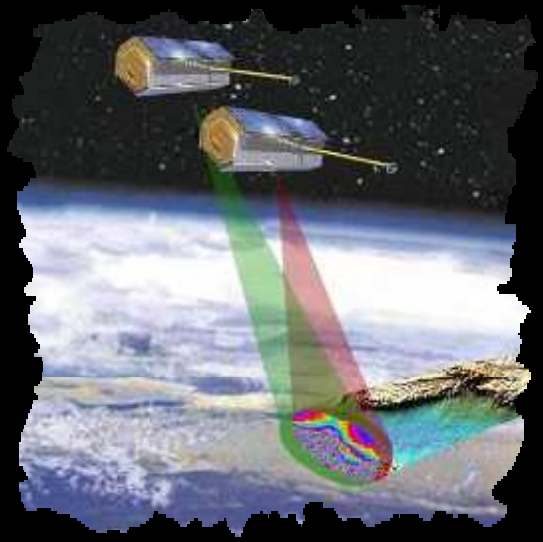
RISAT



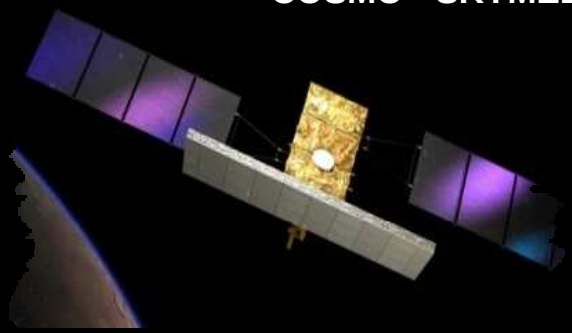
SENTINEL 1A



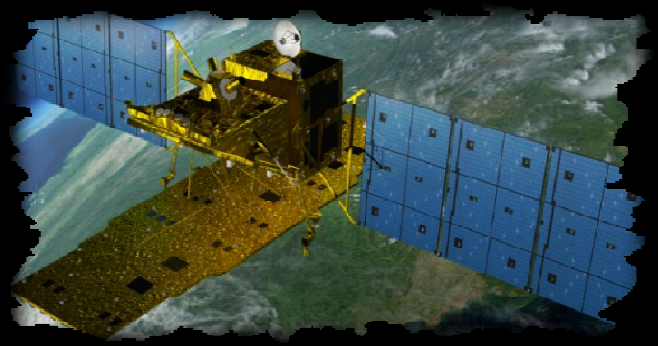
TANDEM-X



COSMO - SKYMED

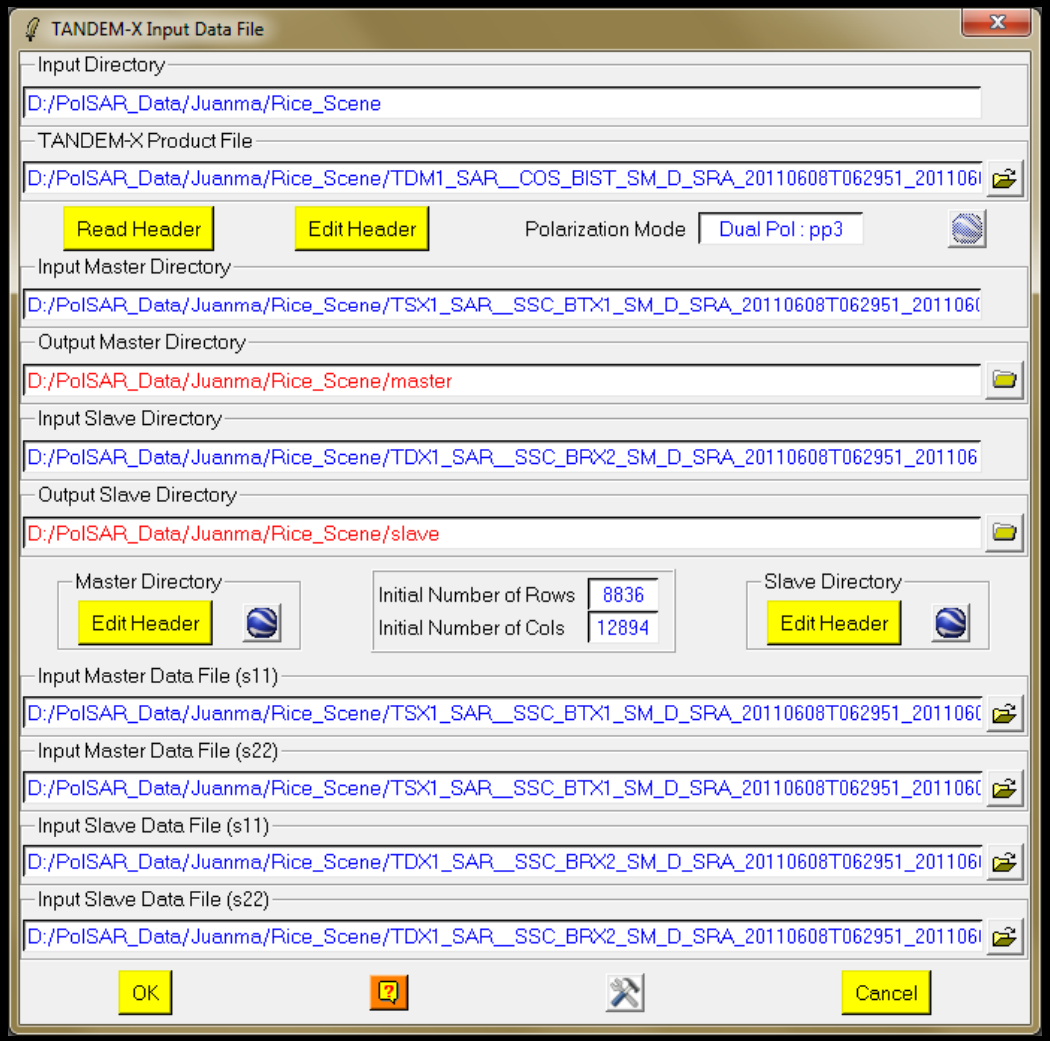


ALOS-2 – PALSAR

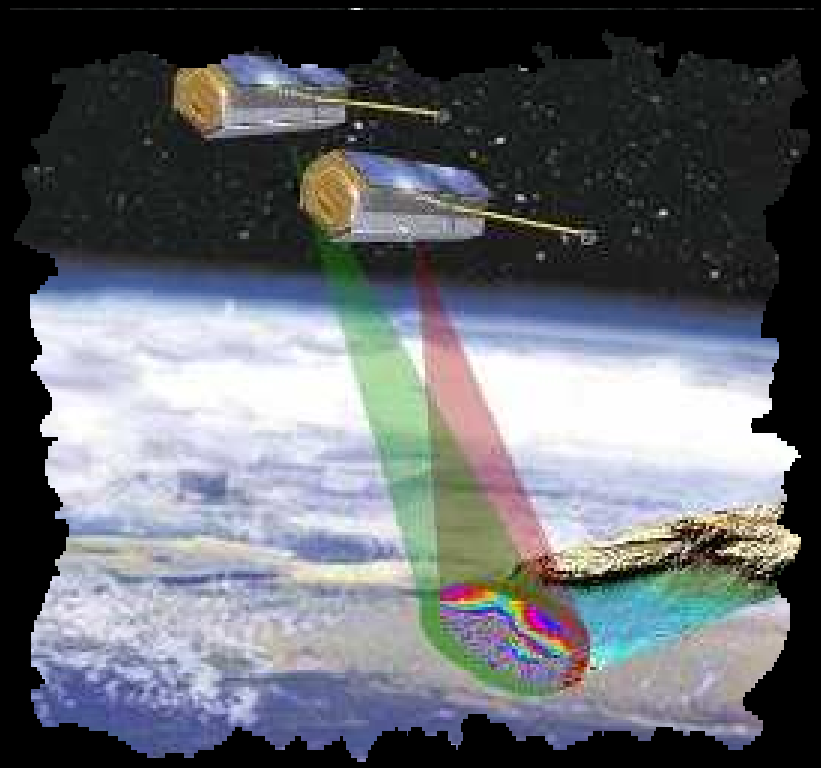


PolSARpro v5.0 Software offers the possibility to handle and convert polarimetric data from a range of well established polarimetric spaceborne platforms.

PolSARpro v5.0 SOFTWARE



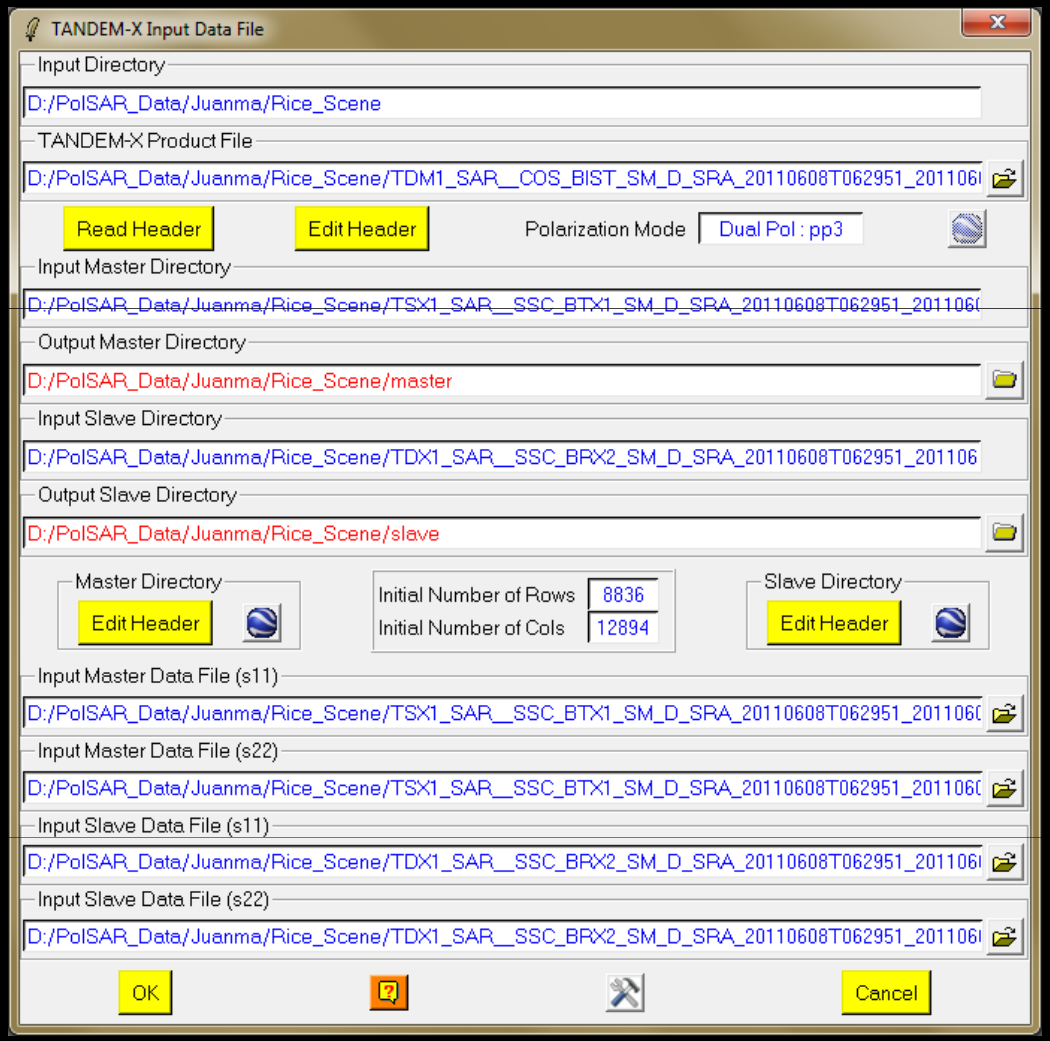
TANDEM – X

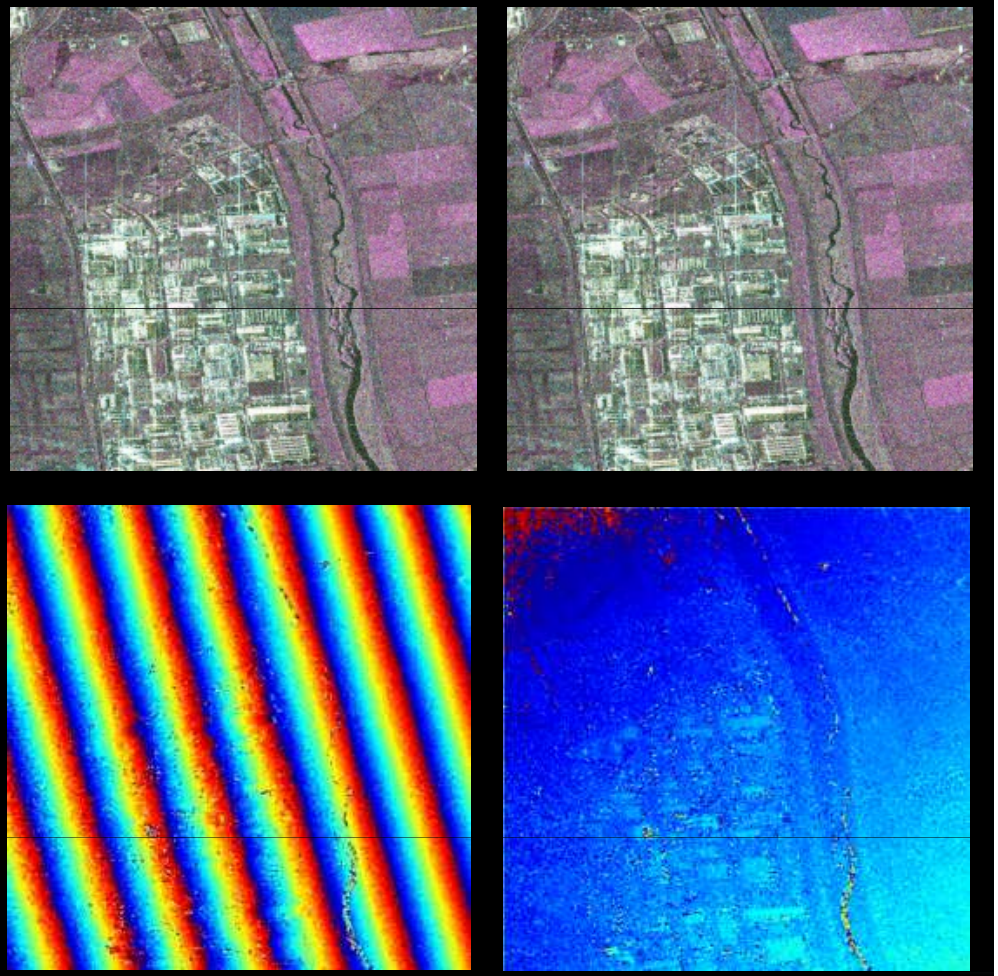


SSC: Single Look Slant Range Complex

- **TanDEM – X Dual POL**

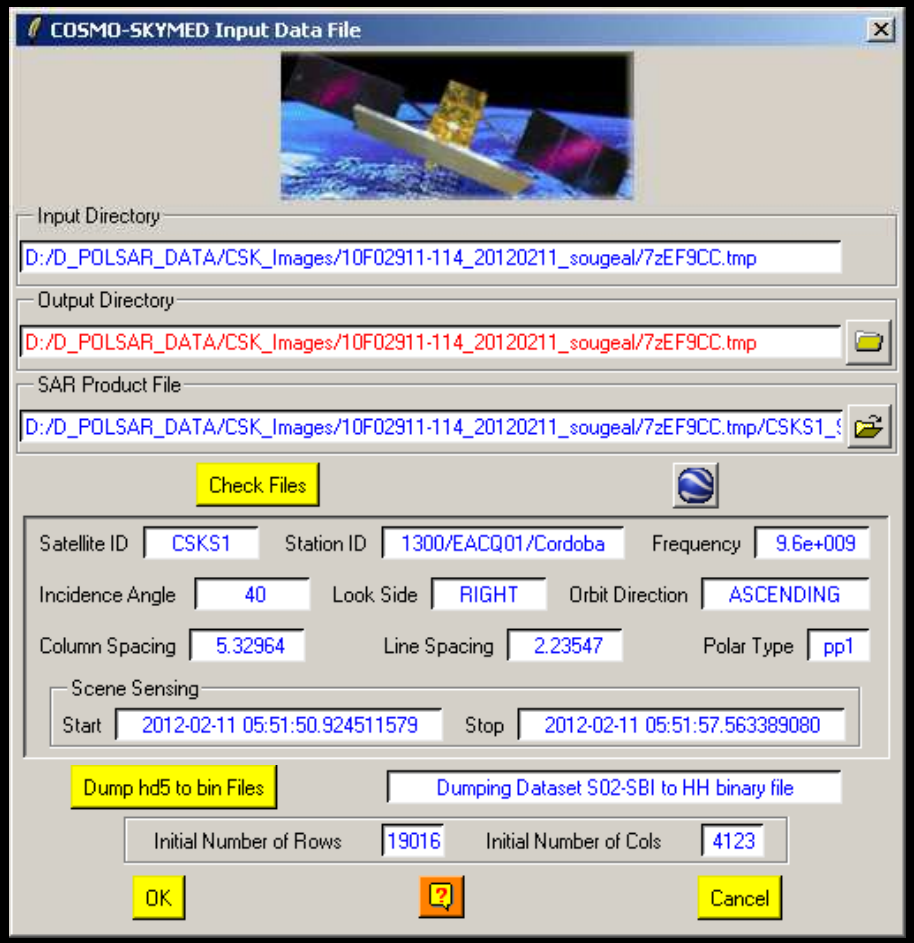
PolSARpro v5.0 SOFTWARE



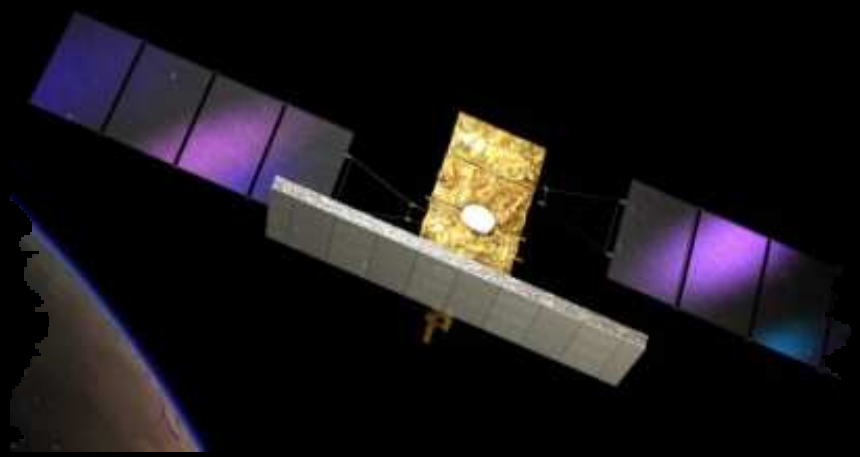


- **TanDEM – X Dual POL**

PolSARpro v5.0 SOFTWARE



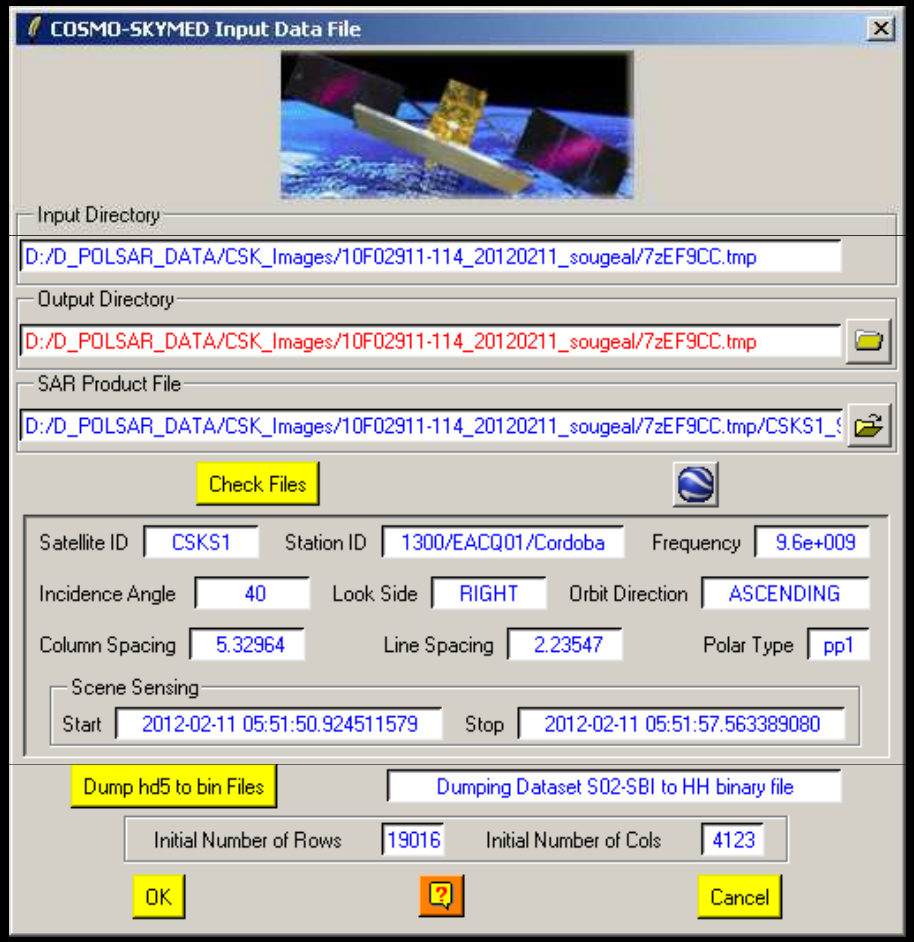
COSMO-SKYMED

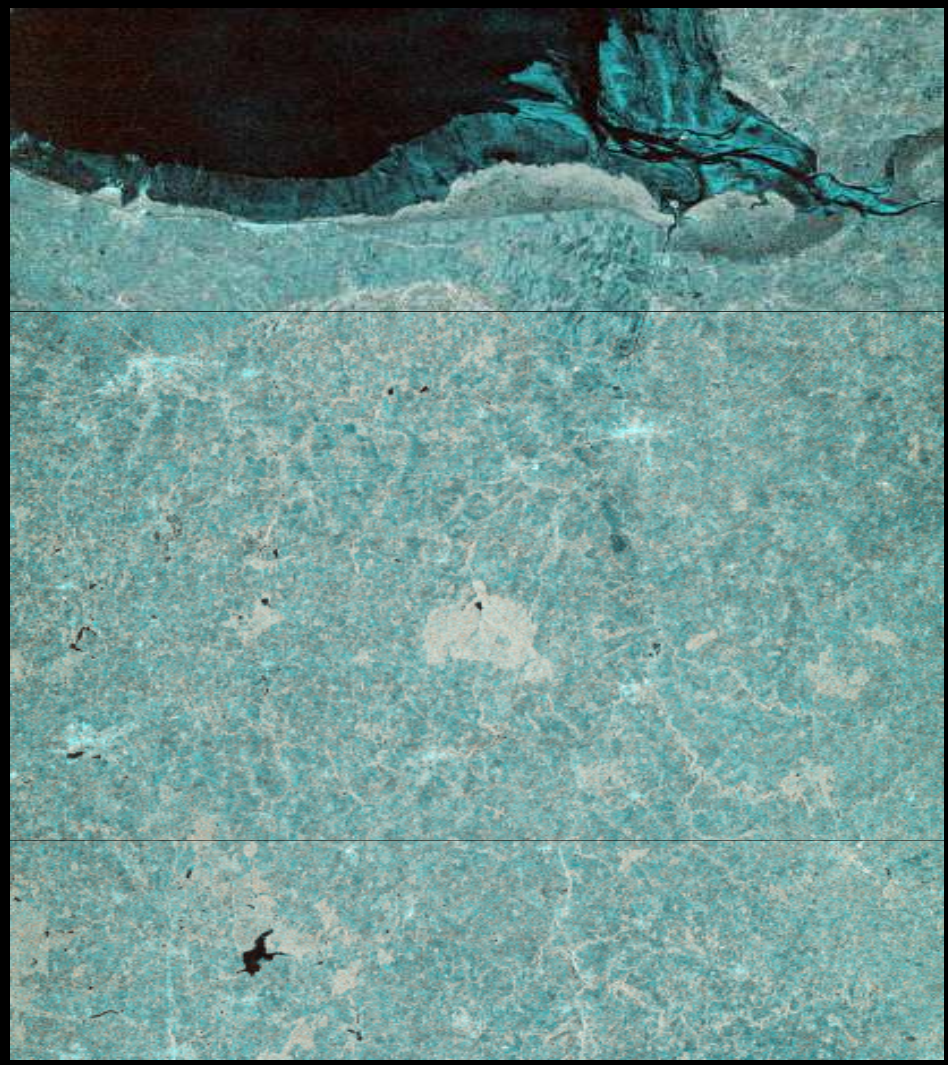


SSC: Single Look Slant Range Complex

- **COSMO-SKYMED Dual POL**

PolSARpro v5.0 SOFTWARE

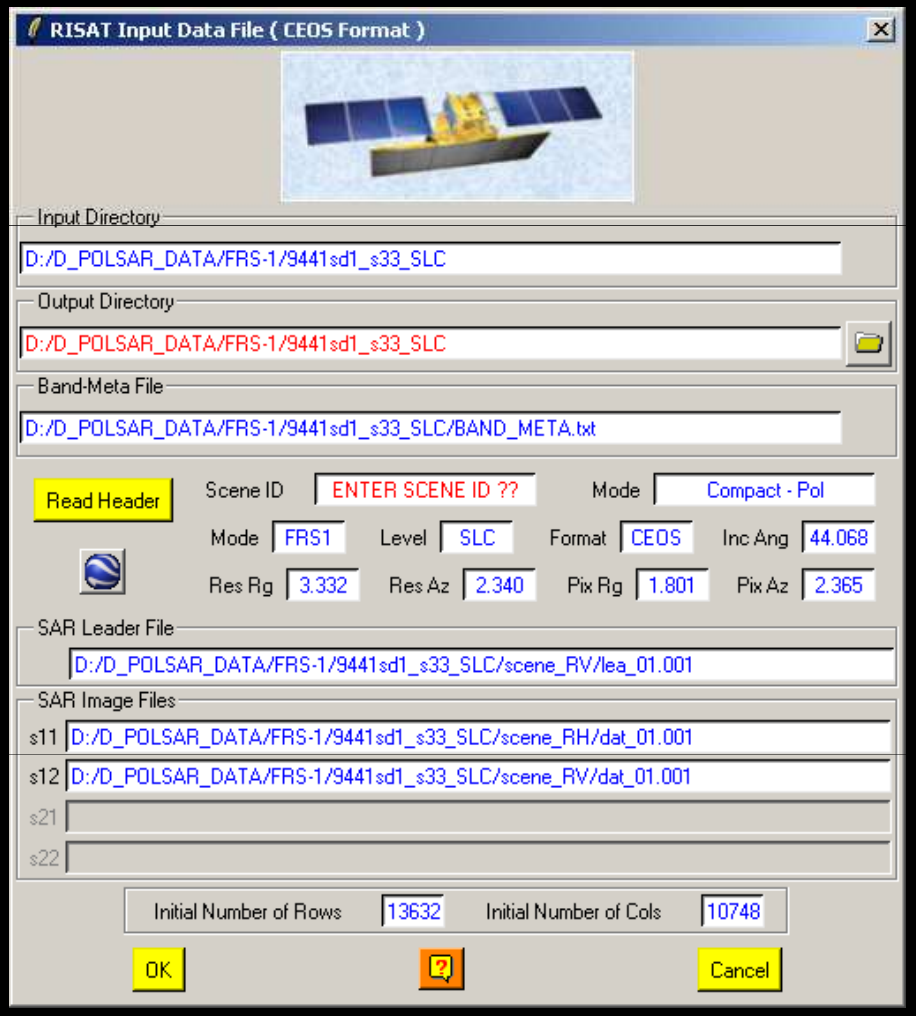


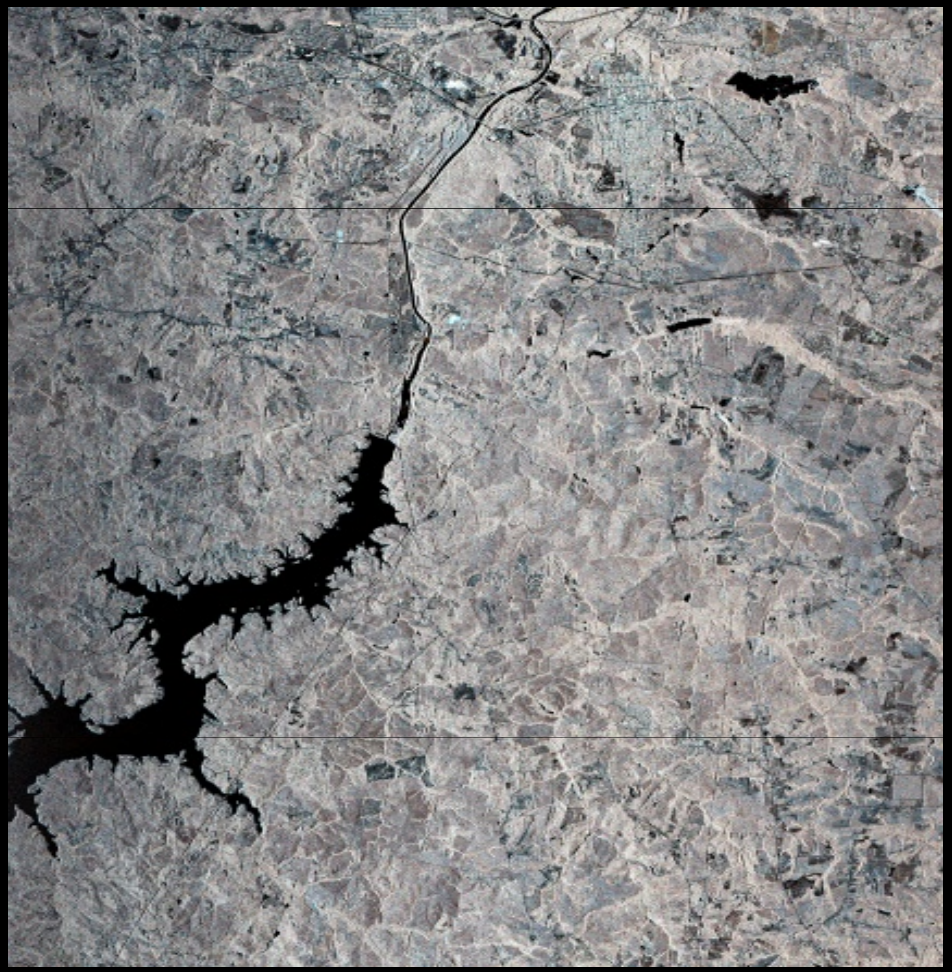


- **COSMO-SKYMED Dual POL**

PolSARpro v5.0 SOFTWARE

RISAT

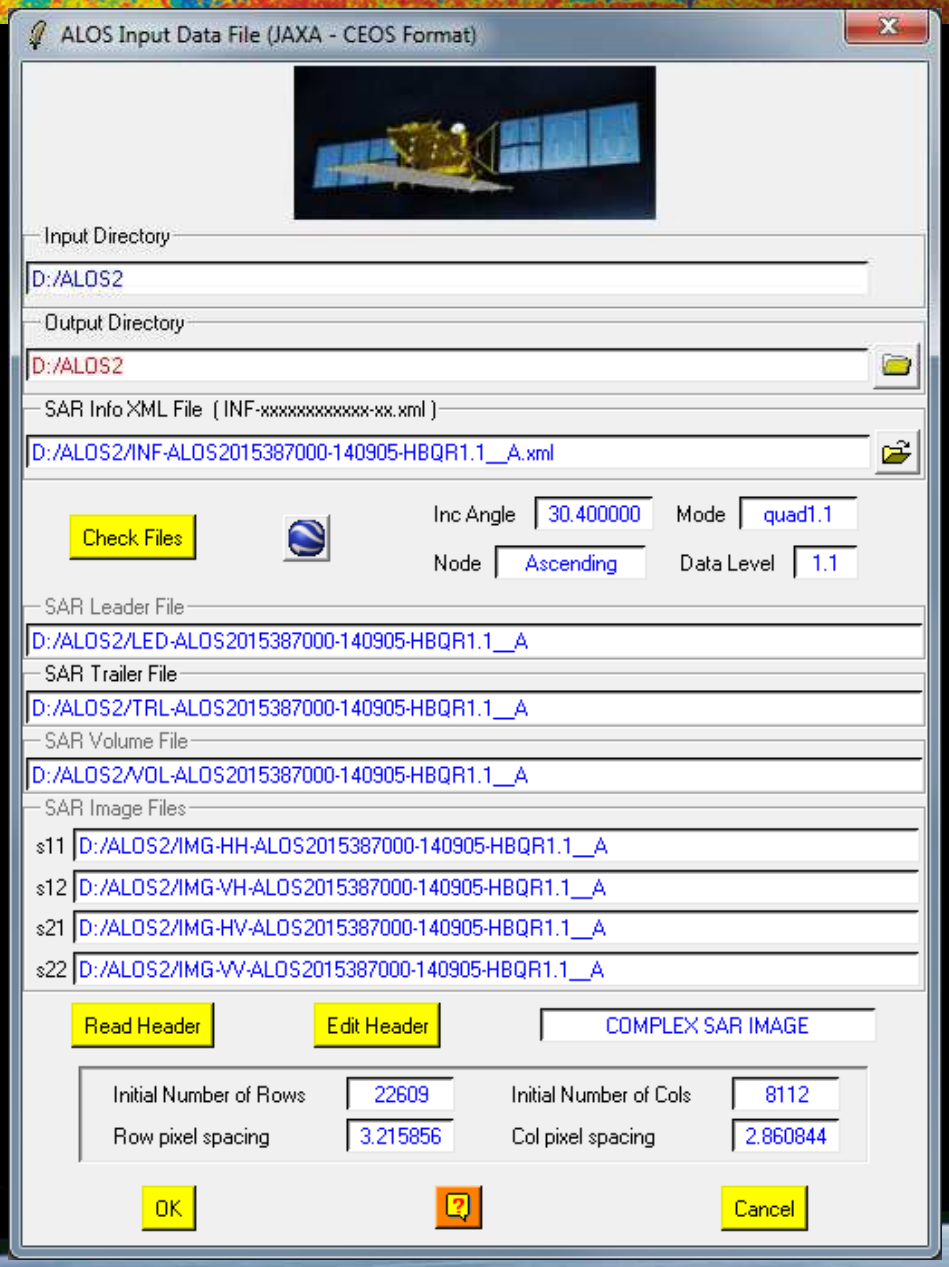




- **RISAT Dual POL – Compact POL**

PolSARpro v5.0 SOFTWARE

esa



ALOS – PALSAR

ALOS-PALSAR Polar Modes

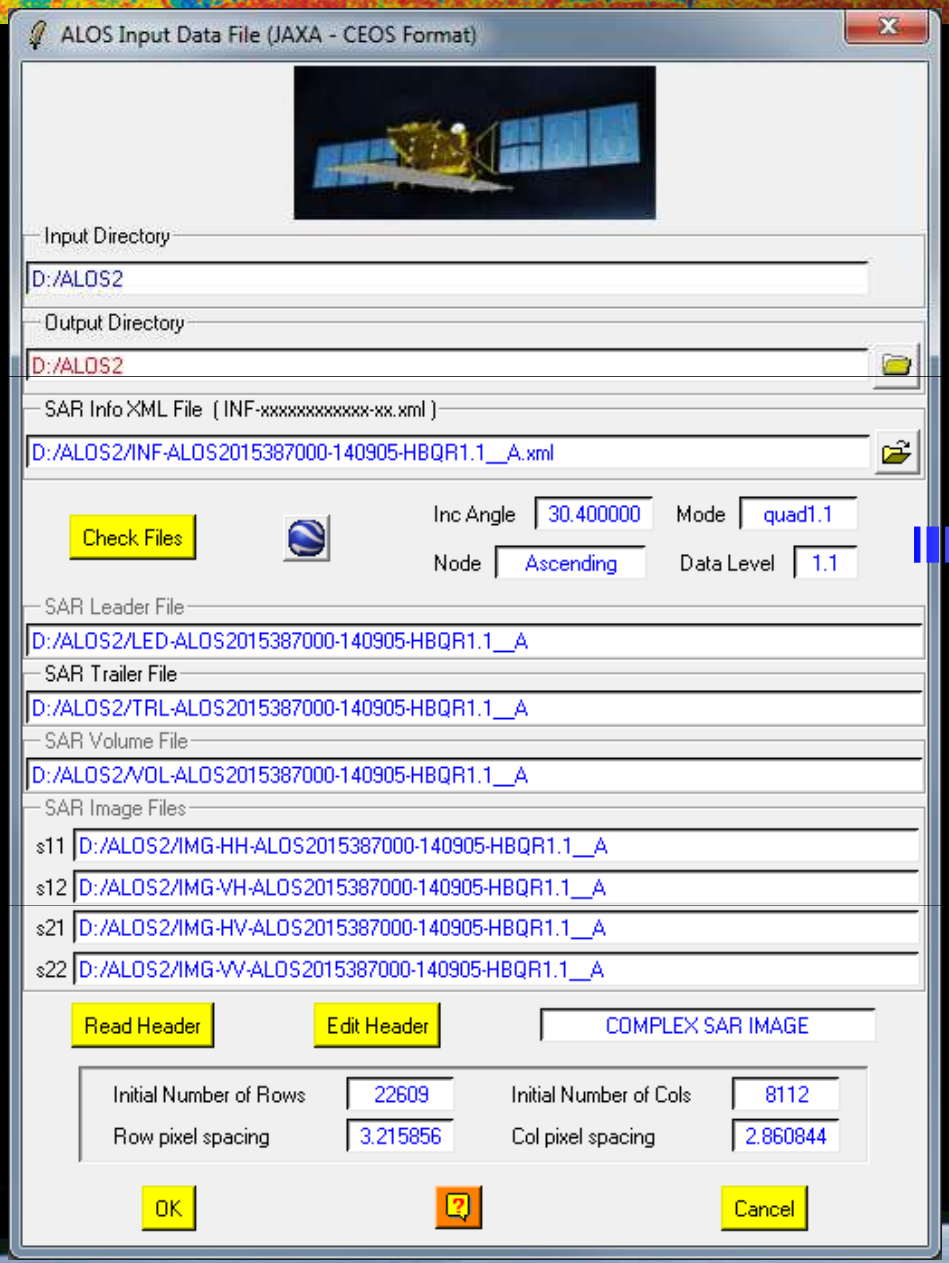
- PALSAR Dual & Quad POL
- PALSAR Data Level 1.1 and 1.5

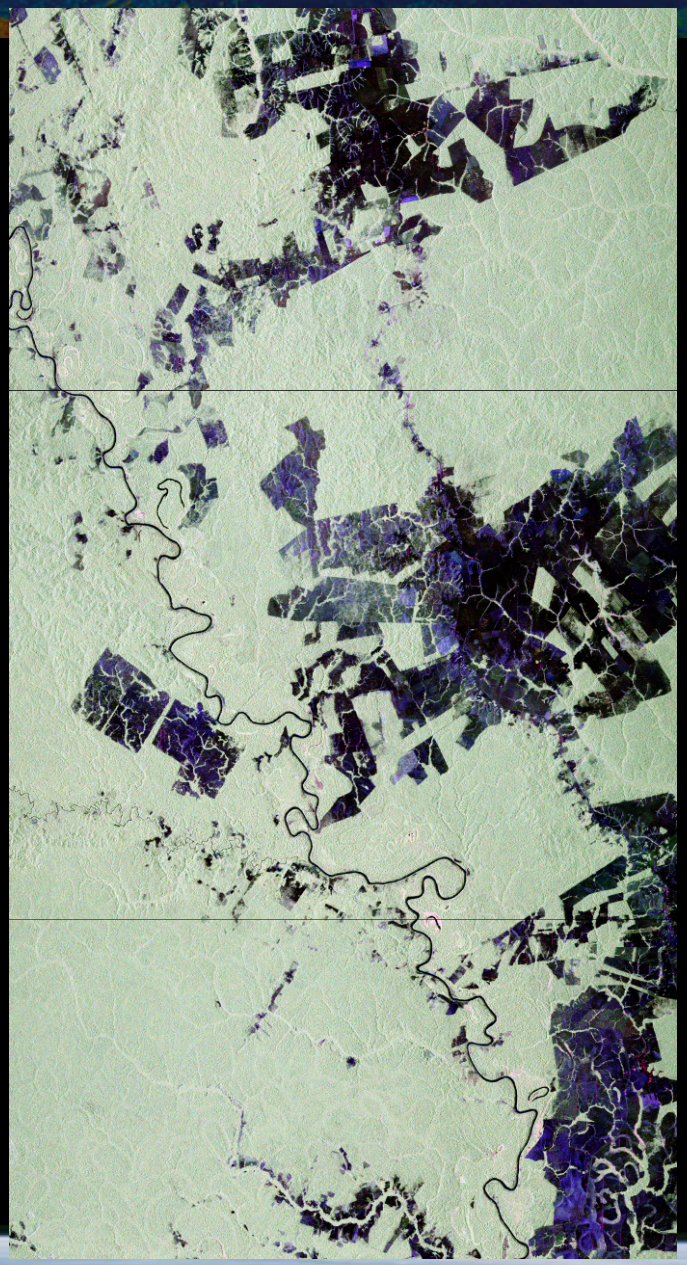
JAXA - CEOS Data Format

New!

PolSARpro v5.0 SOFTWARE

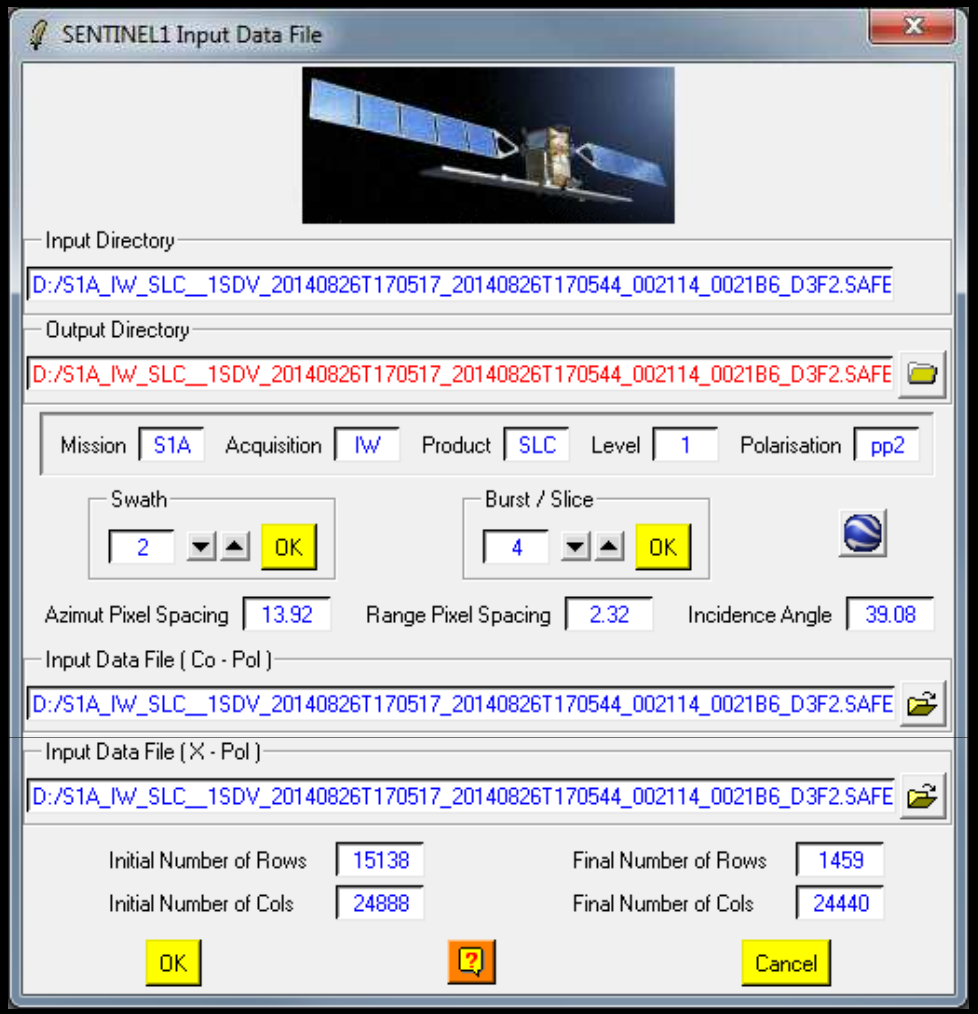
esa





JAXA - CEOS Data Format

PRELIMINARY RESULTS



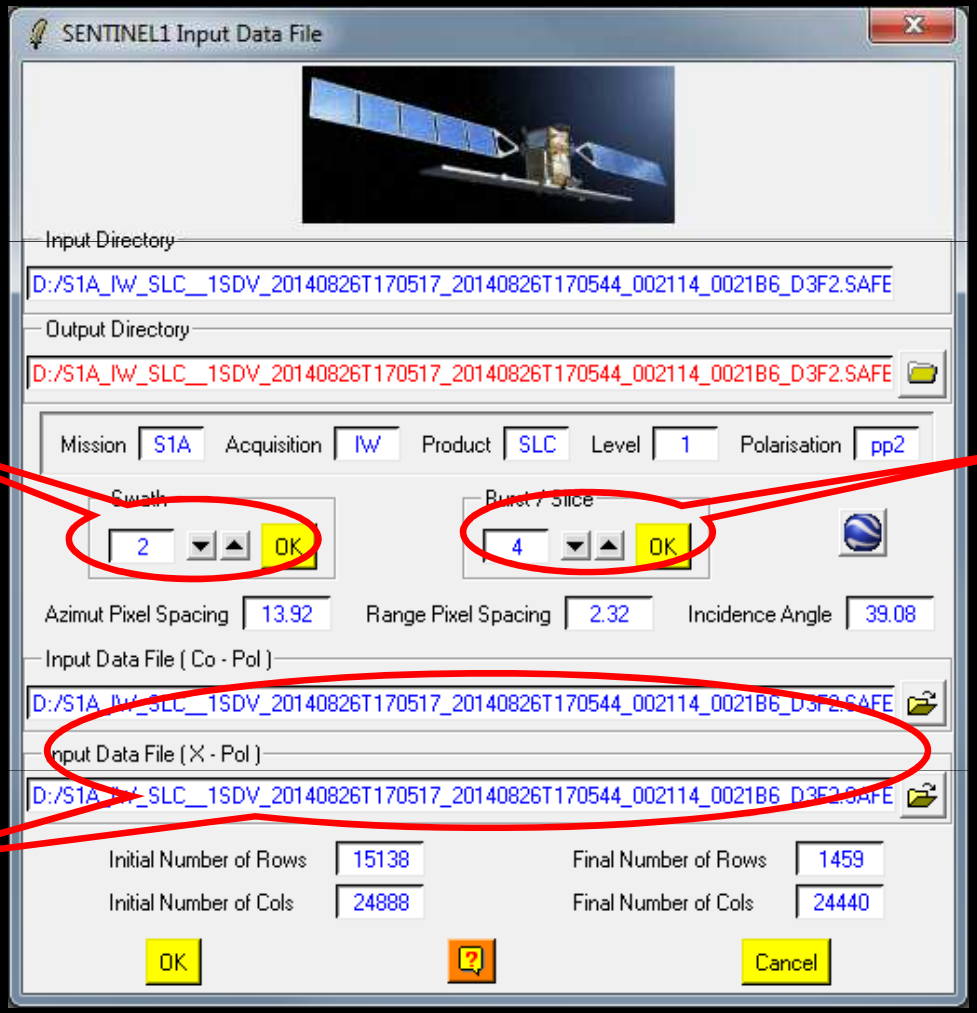
- **Dual – Pol datasets**
- **SLC product (level 1)**
- **IW & EW mode**

PRELIMINARY RESULTS

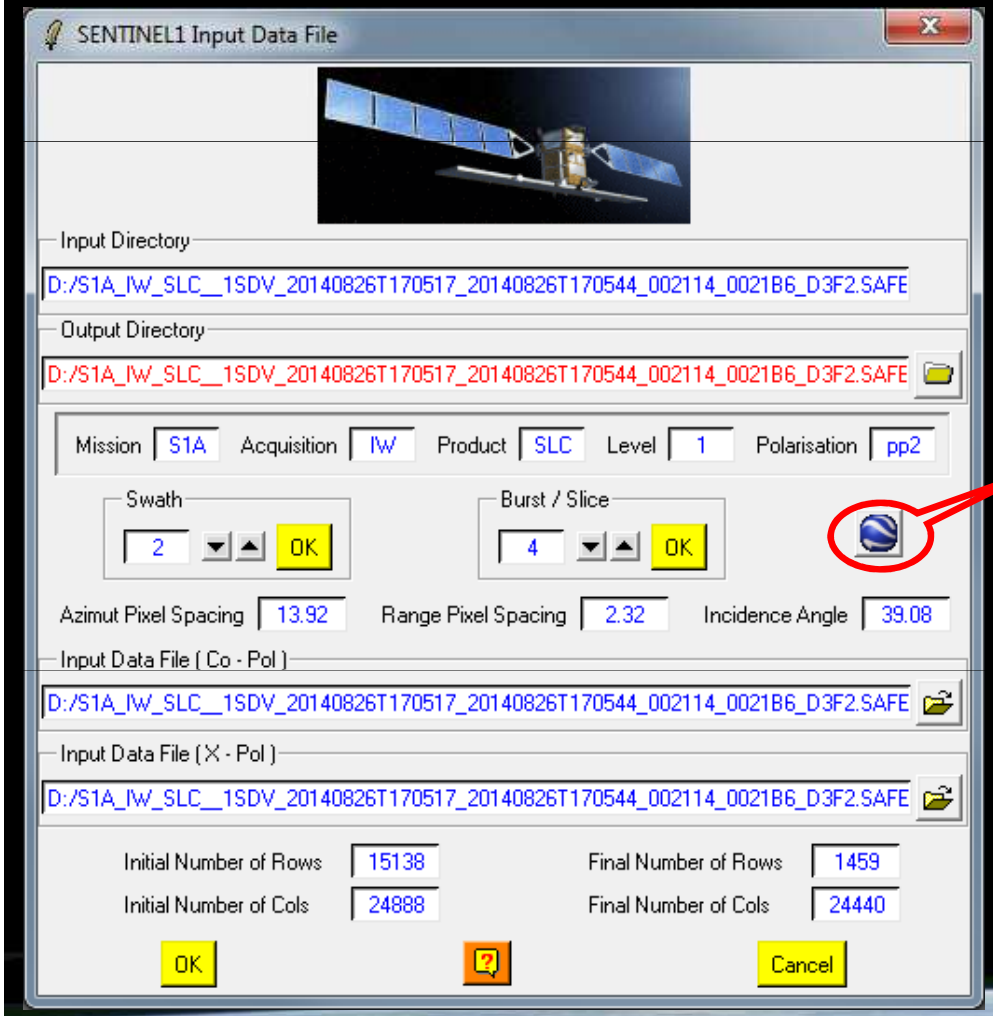
Swath Selection

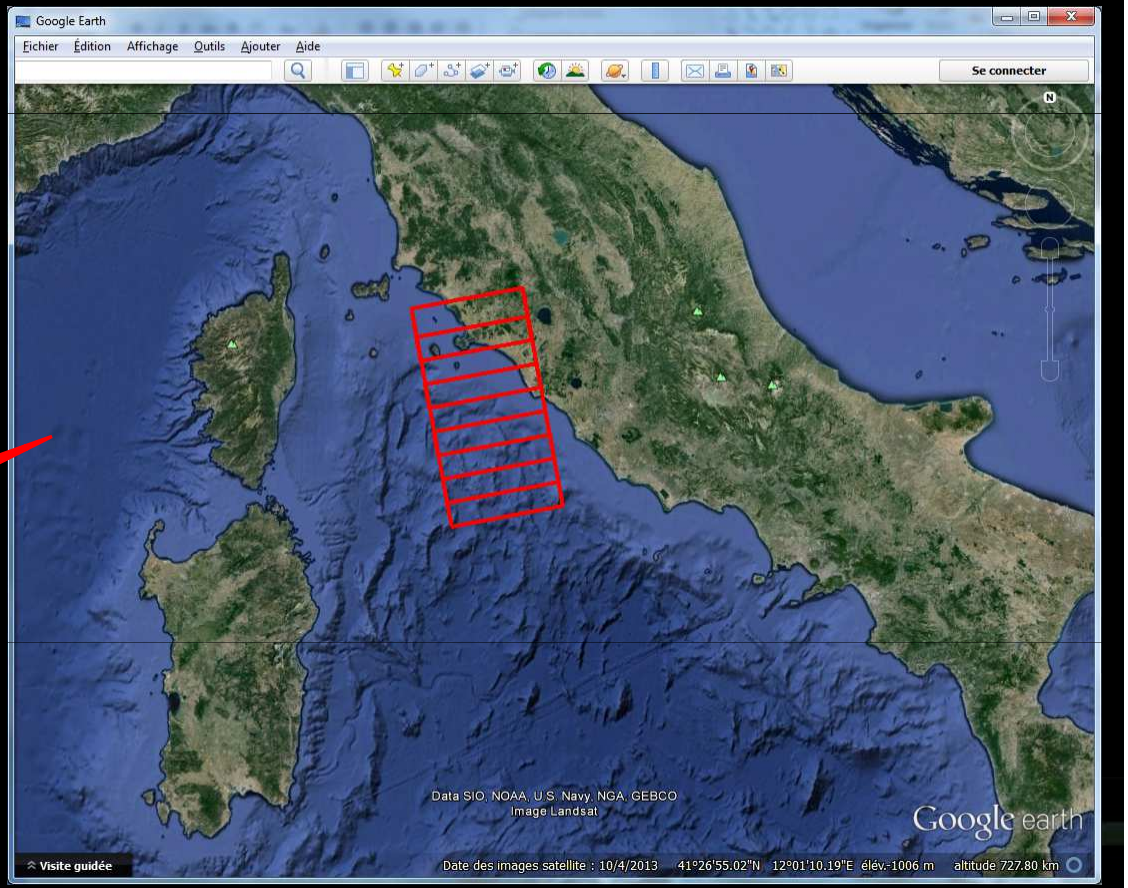
Dual – pol datsets

Selection of the burst to be processed (can also process ALL the bursts of a swath)



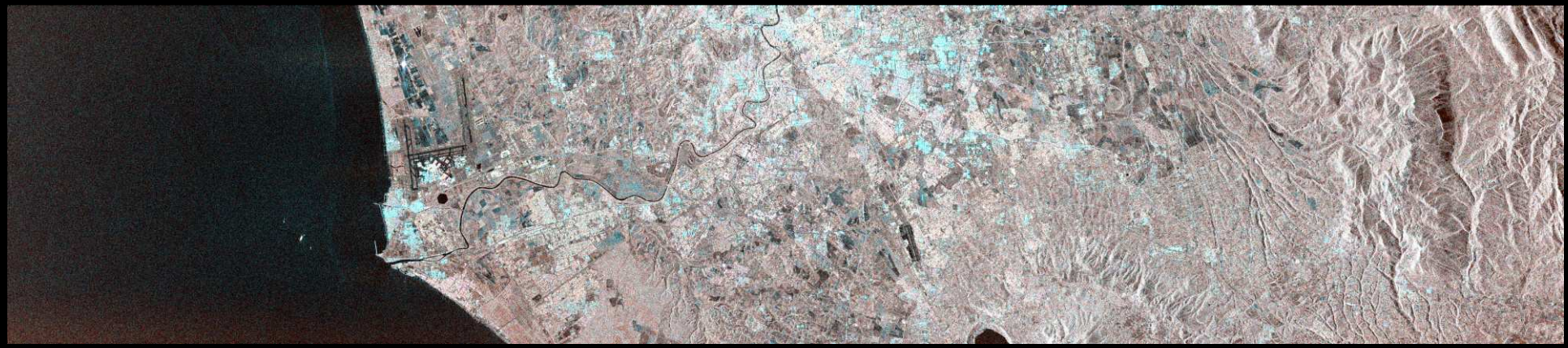
PRELIMINARY RESULTS





PRELIMINARY RESULTS

SLC - IW : Swath 2 – Burst 4



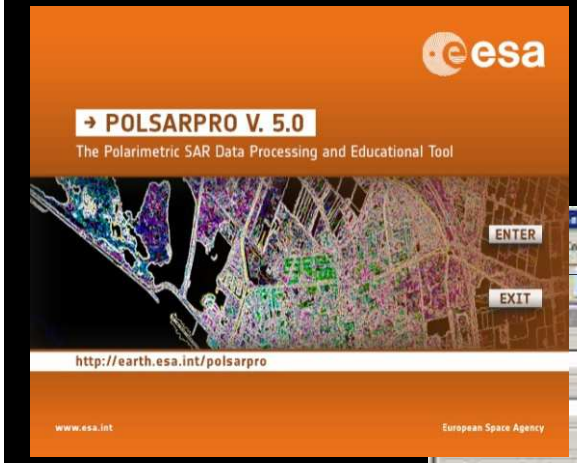
|VH| |VV|/|VH| |VV|

Slant range (no geocoding)

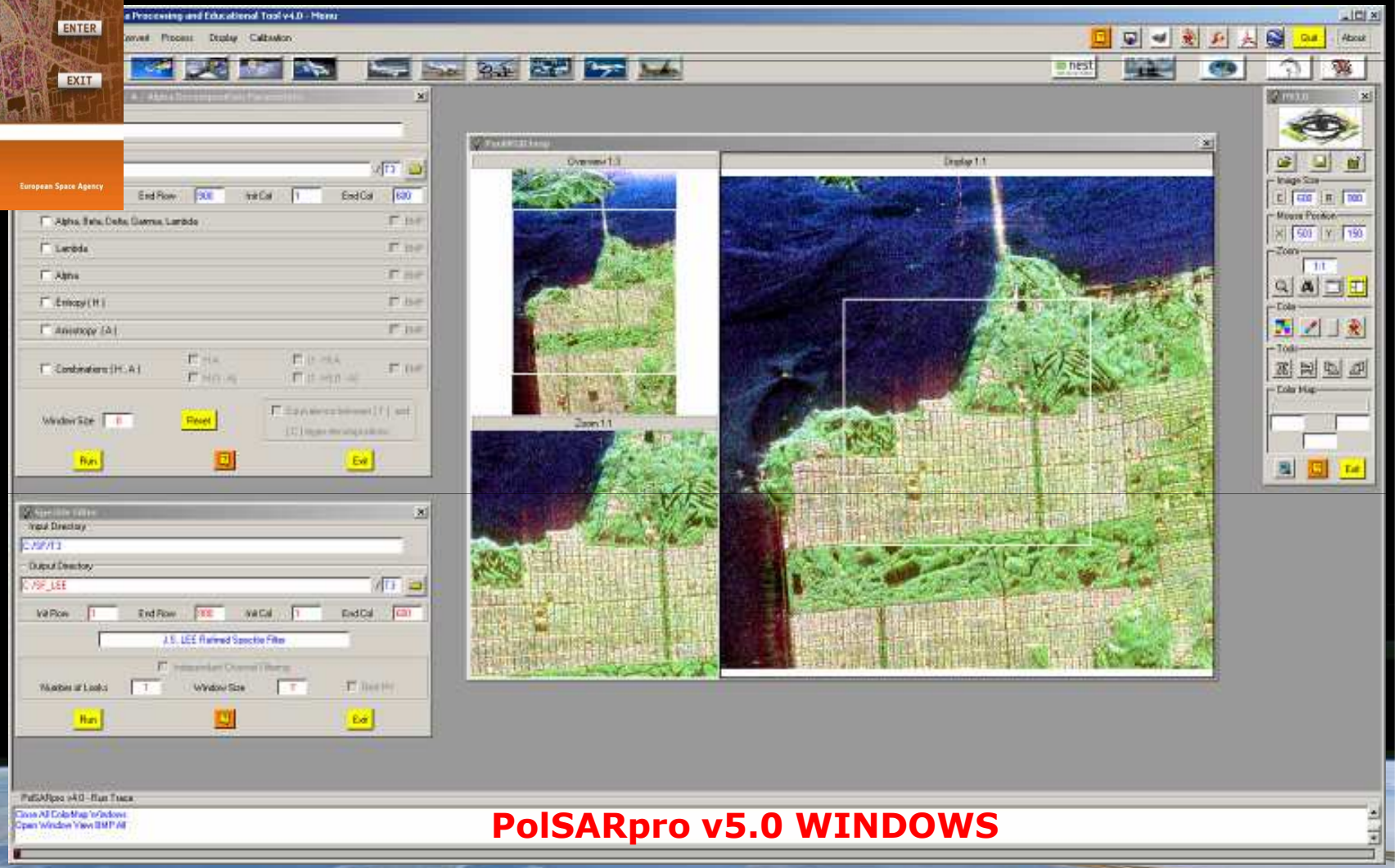
PolSARpro v5.0 SOFTWARE

Software – General Presentation

PolSARpro v5.0 SOFTWARE

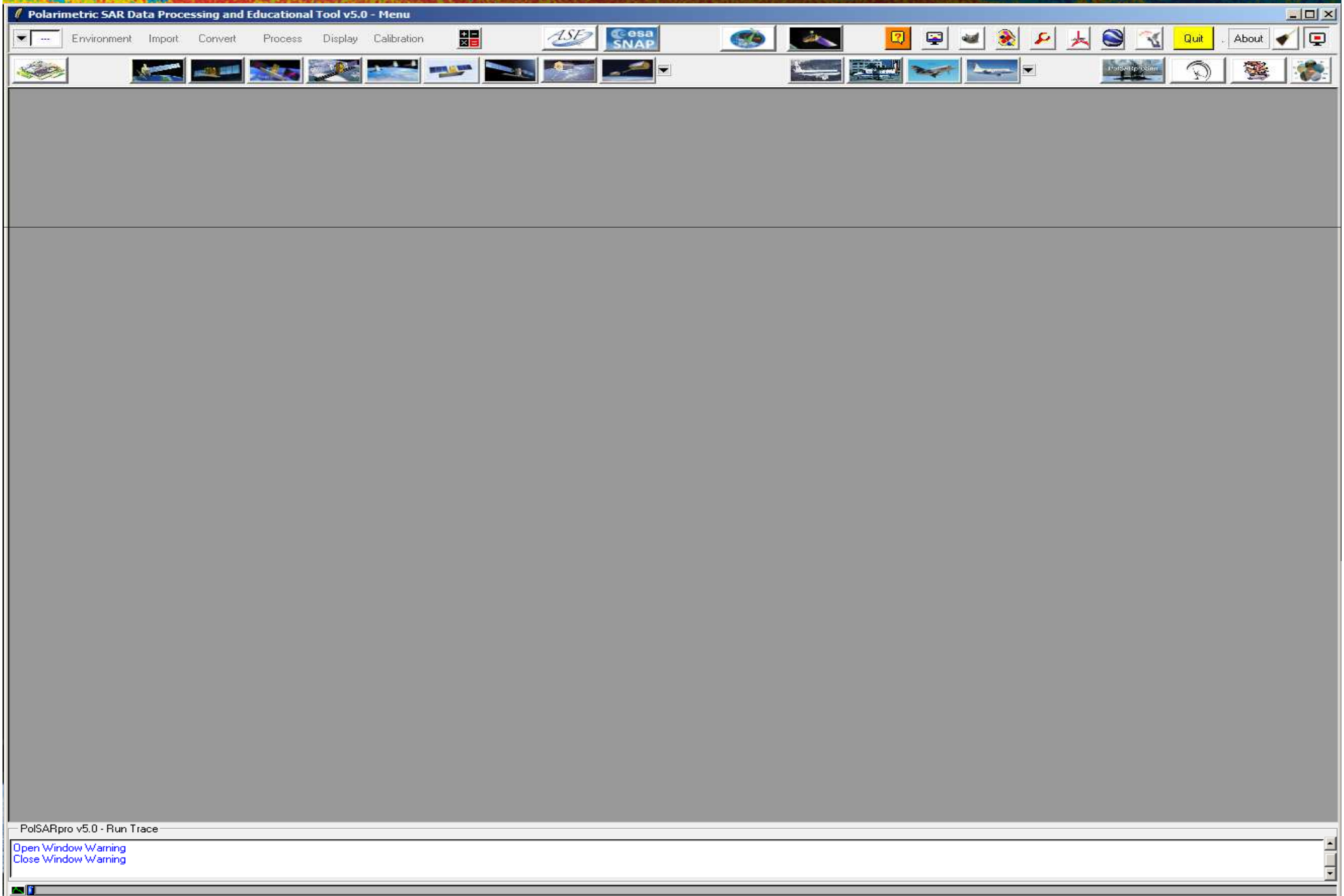


ENTRY SCREEN



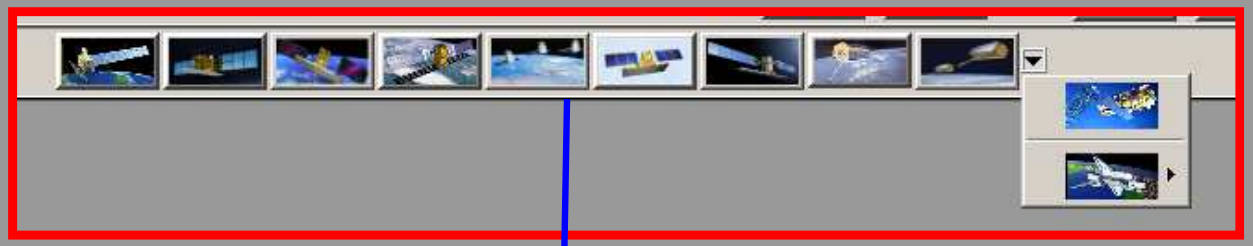
PolSARpro v5.0 WINDOWS

PolSARpro v5.0 SOFTWARE



PolSARpro v5.0 SOFTWARE

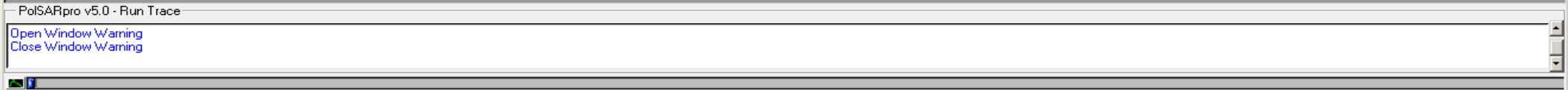
PolSARpro Full Software
– Single Data Set
– Multi Data Sets



Spaceborne Sensors:
ALOS, ALOS-2, ENVISAT
RADARSAT2, RCM, TerraSar, SIR-C
COSMA-SKYMED, RISAT, Tandem-X

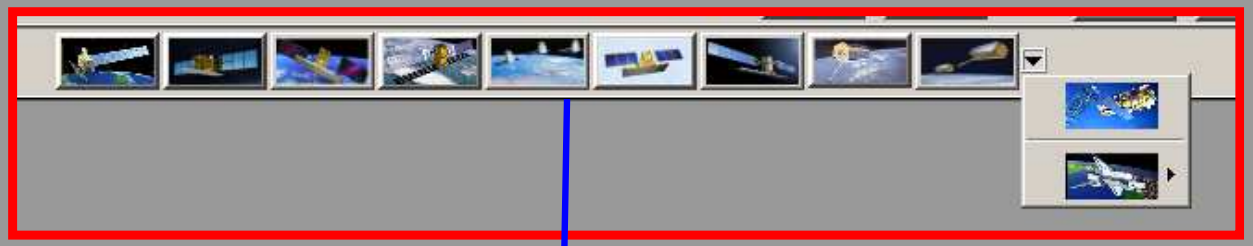
Airborne Sensors:
AIRSAR, Convair, EMISAR
ESAR, PISAR, RAMSES

Version for the EO Scientific Investigator



PolSARpro v5.0 SOFTWARE

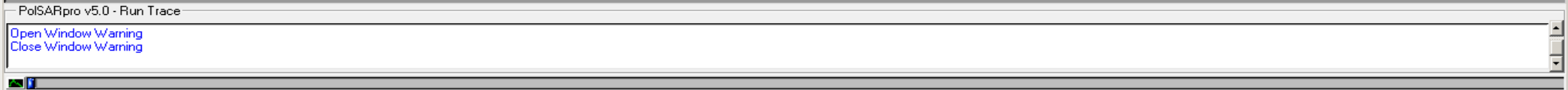
PolSARpro Full Software
– Single Data Set
– Multi Data Sets : Time Series POLSAR



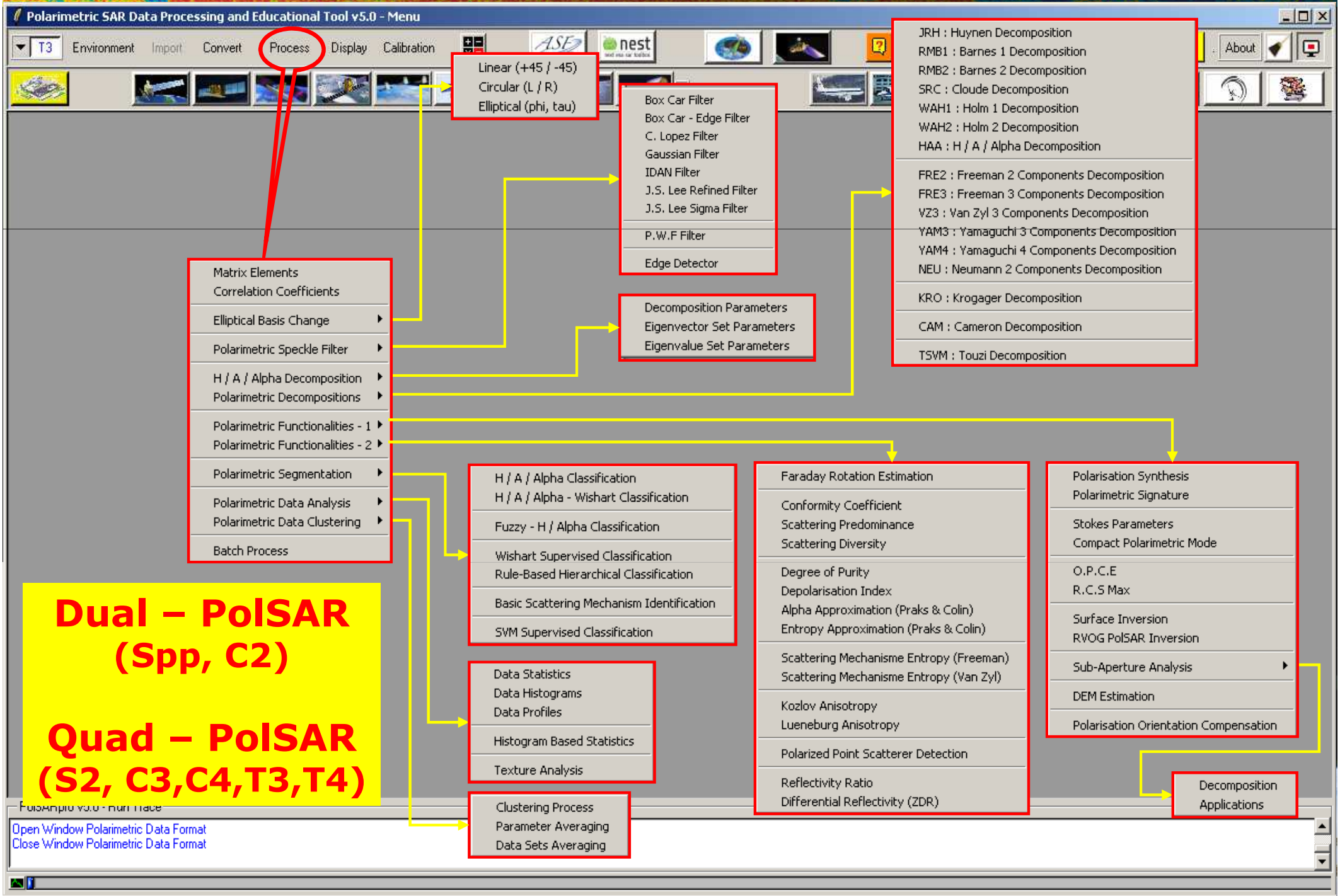
Spaceborne Sensors:
ALOS, ALOS-2, ENVISAT
RADARSAT2, RCM, TerraSar, SIR-C
COSMA-SKYMED, RISAT, Tandem-X

Airborne Sensors:
AIRSAR, Convair, EMISAR
ESAR, PISAR, RAMSES

Version for the EO Scientific Investigator

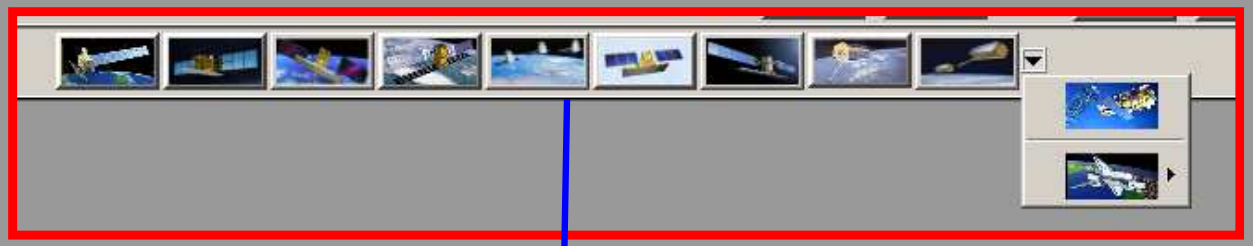


PolSARpro v5.0 SOFTWARE



PolSARpro v5.0 SOFTWARE

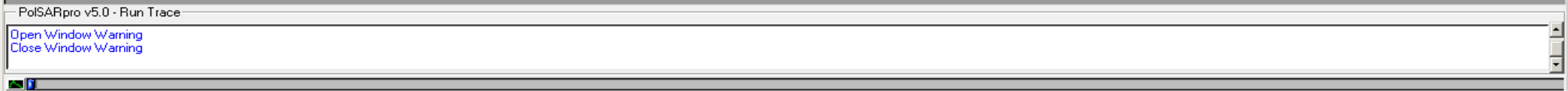
PolSARpro Full Software
– Single Data Set
– Multi Data Sets : Time Series POLSAR



Spaceborne Sensors:
ALOS, ALOS-2, ENVISAT
RADARSAT2, RCM, TerraSar, SIR-C
COSMA-SKYMED, RISAT, Tandem-X

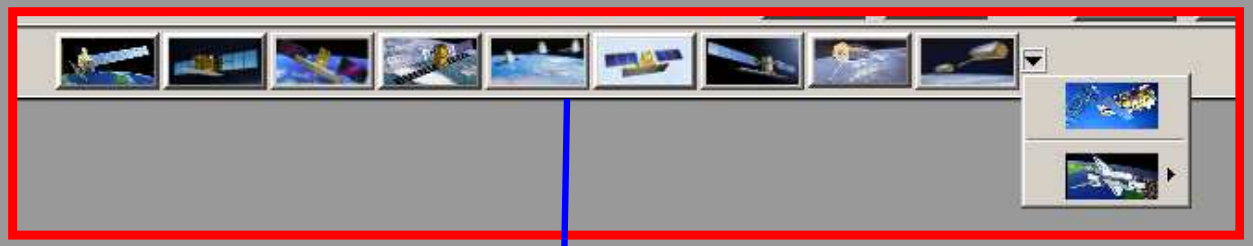
Airborne Sensors:
AIRSAR, Convair, EMISAR
ESAR, PISAR, RAMSES

Version for the EO Scientific Investigator



PolSARpro v5.0 SOFTWARE

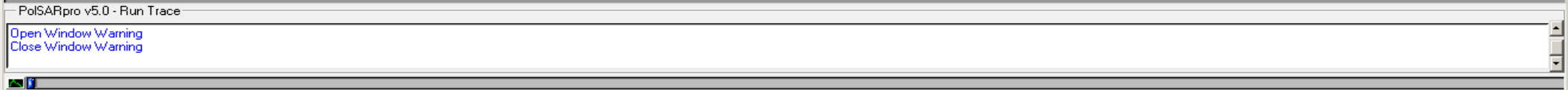
PolSARpro Full Software
– Single Data Set
– Multi Data Sets : Single Baseline Pol-InSAR



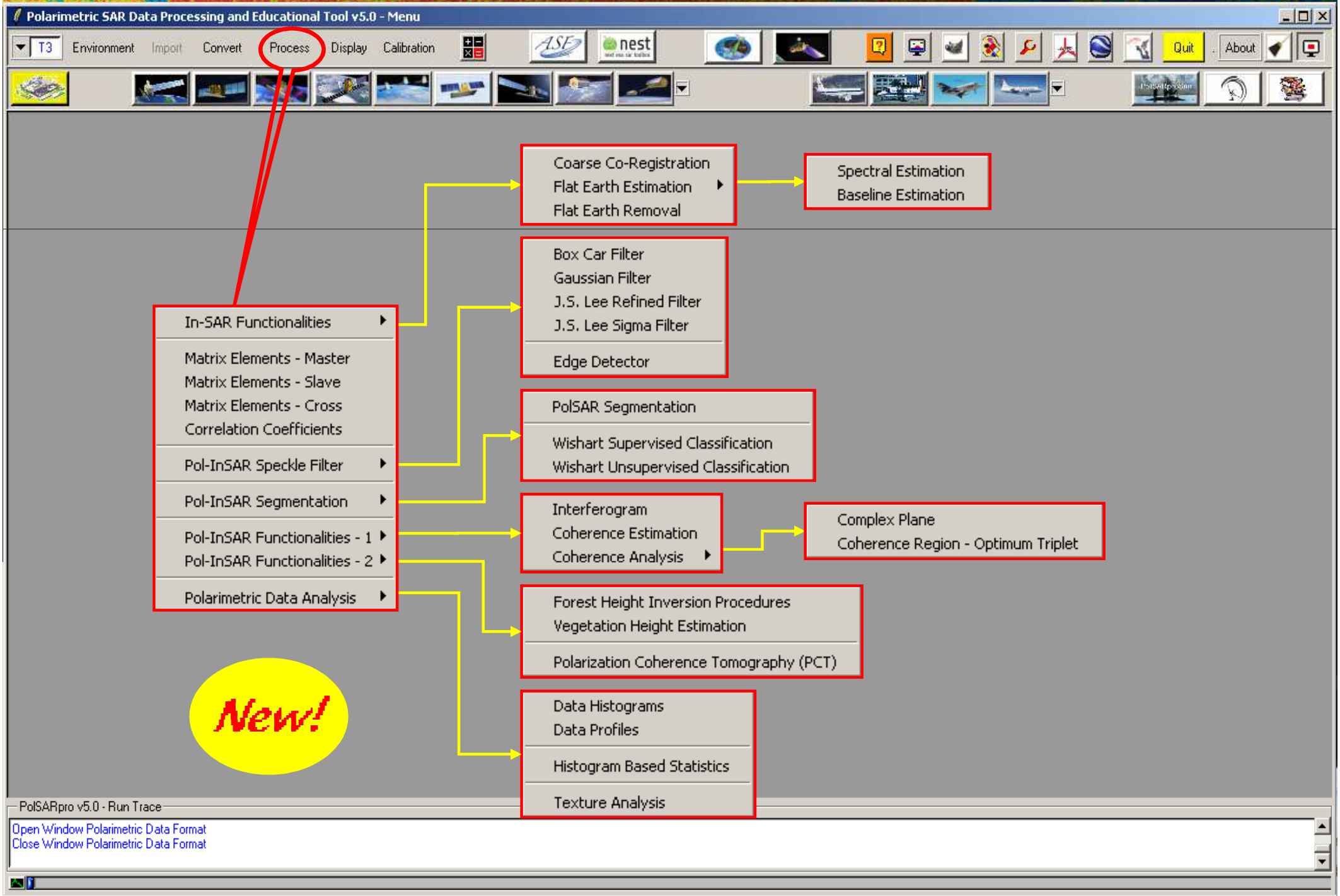
Spaceborne Sensors:
ALOS, ALOS-2, ENVISAT
RADARSAT2, RCM, TerraSar, SIR-C
COSMA-SKYMED, RISAT, Tandem-X

Airborne Sensors:
AIRSAR, Convair, EMISAR
ESAR, PISAR, RAMSES

Version for the EO Scientific Investigator

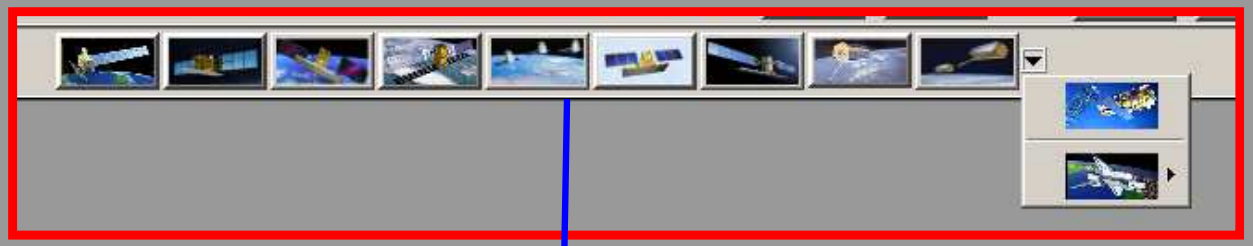


PolSARpro v5.0 SOFTWARE



PolSARpro v5.0 SOFTWARE

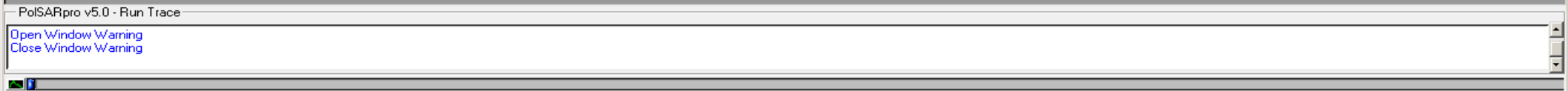
PolSARpro Full Software
– Single Data Set
– Multi Data Sets : Time Series POLSAR



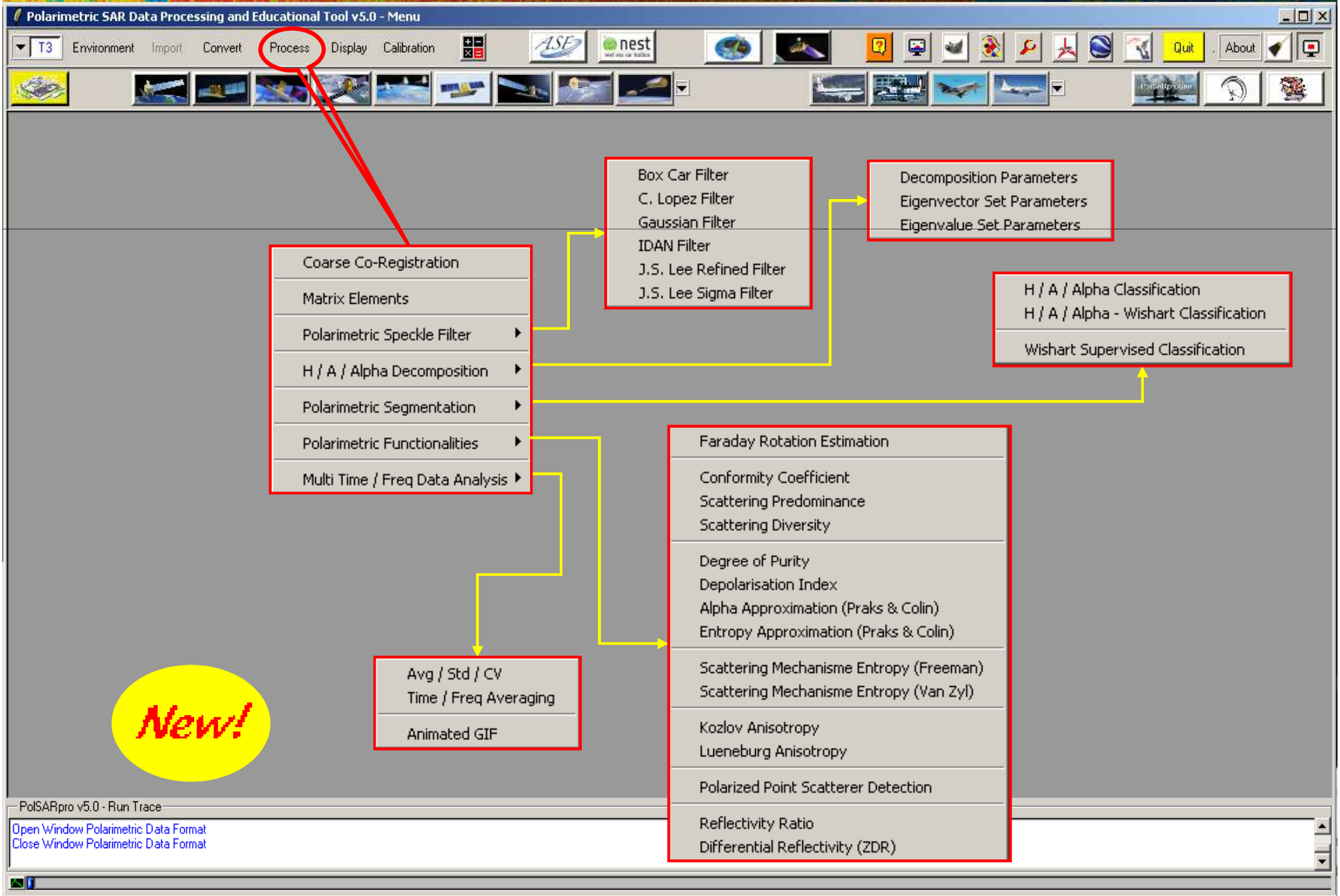
Spaceborne Sensors:
ALOS, ALOS-2, ENVISAT
RADARSAT2, RCM, TerraSar, SIR-C
COSMA-SKYMED, RISAT, Tandem-X

Airborne Sensors:
AIRSAR, Convair, EMISAR
ESAR, PISAR, RAMSES

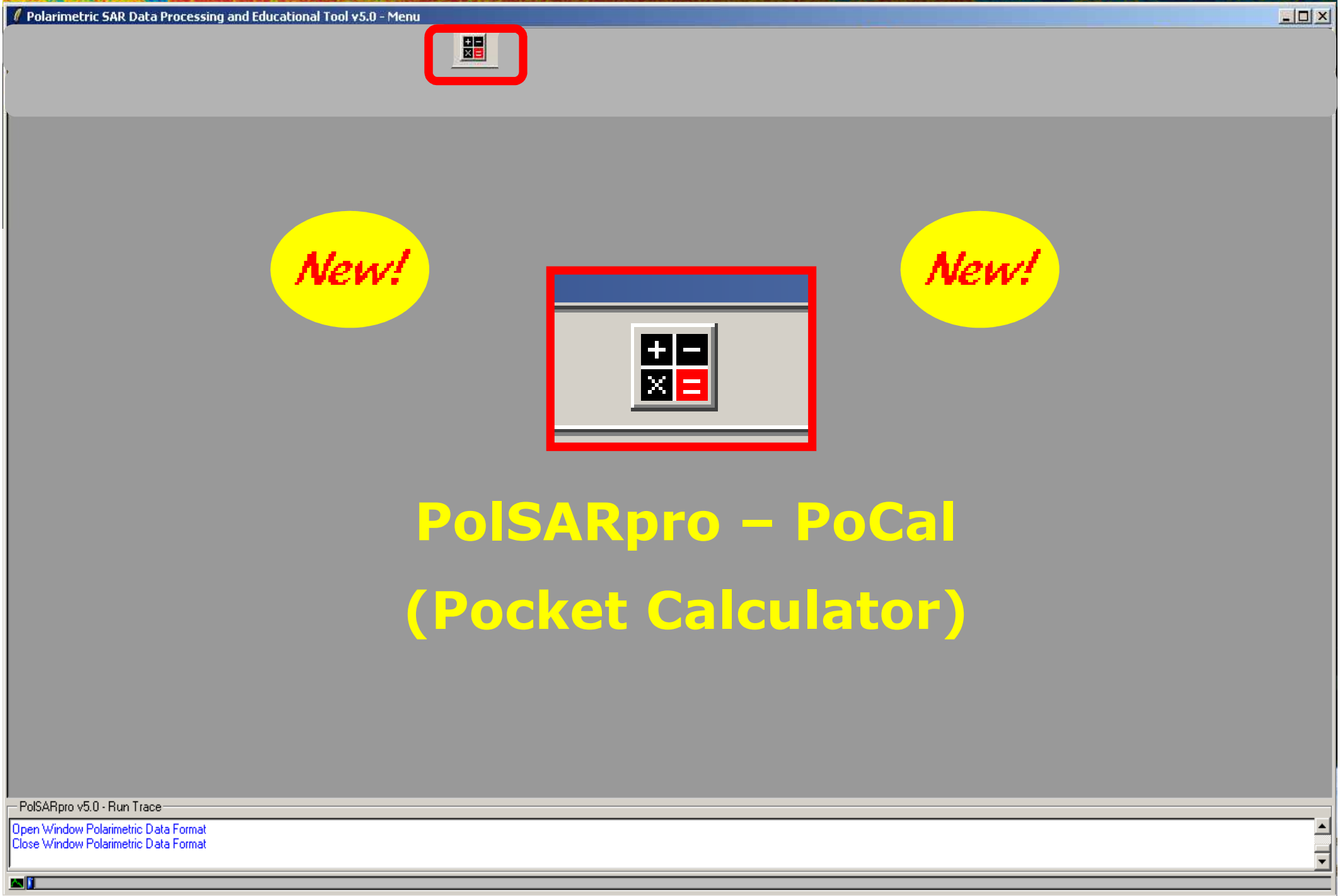
Version for the EO Scientific Investigator



PolSARpro v5.0 SOFTWARE

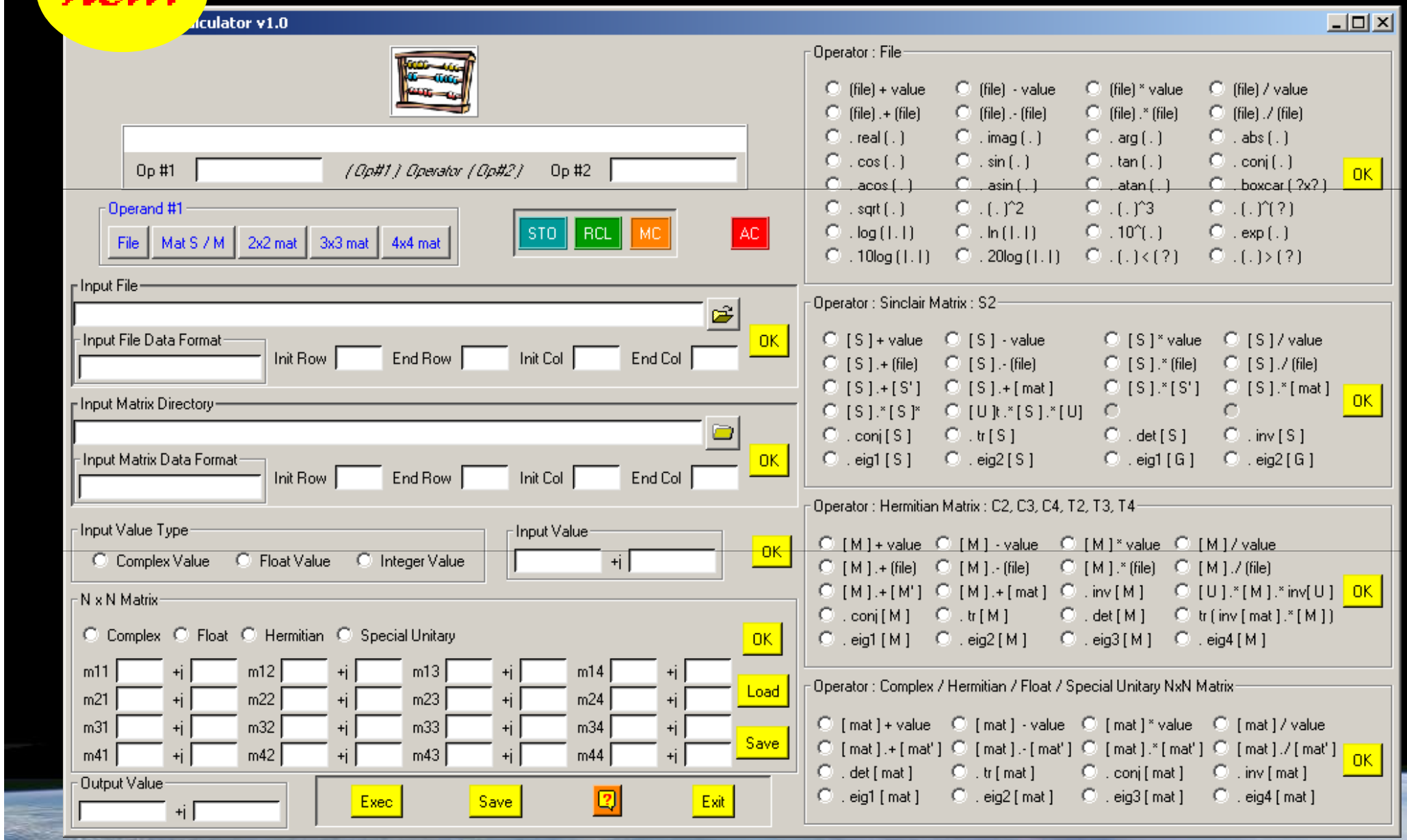


PolSARpro v5.0 SOFTWARE



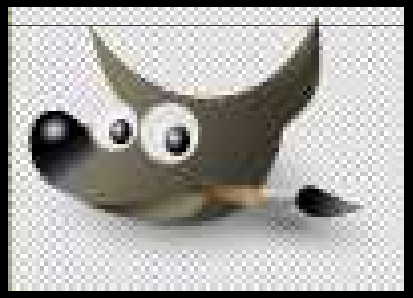
PolSARpro v5.0 SOFTWARE

New!



External Softwares

G.I.M.P



GNU Image Manipulation Program
Open Source
GNU License
(Win, Linux, Unix)

G.I.M.P

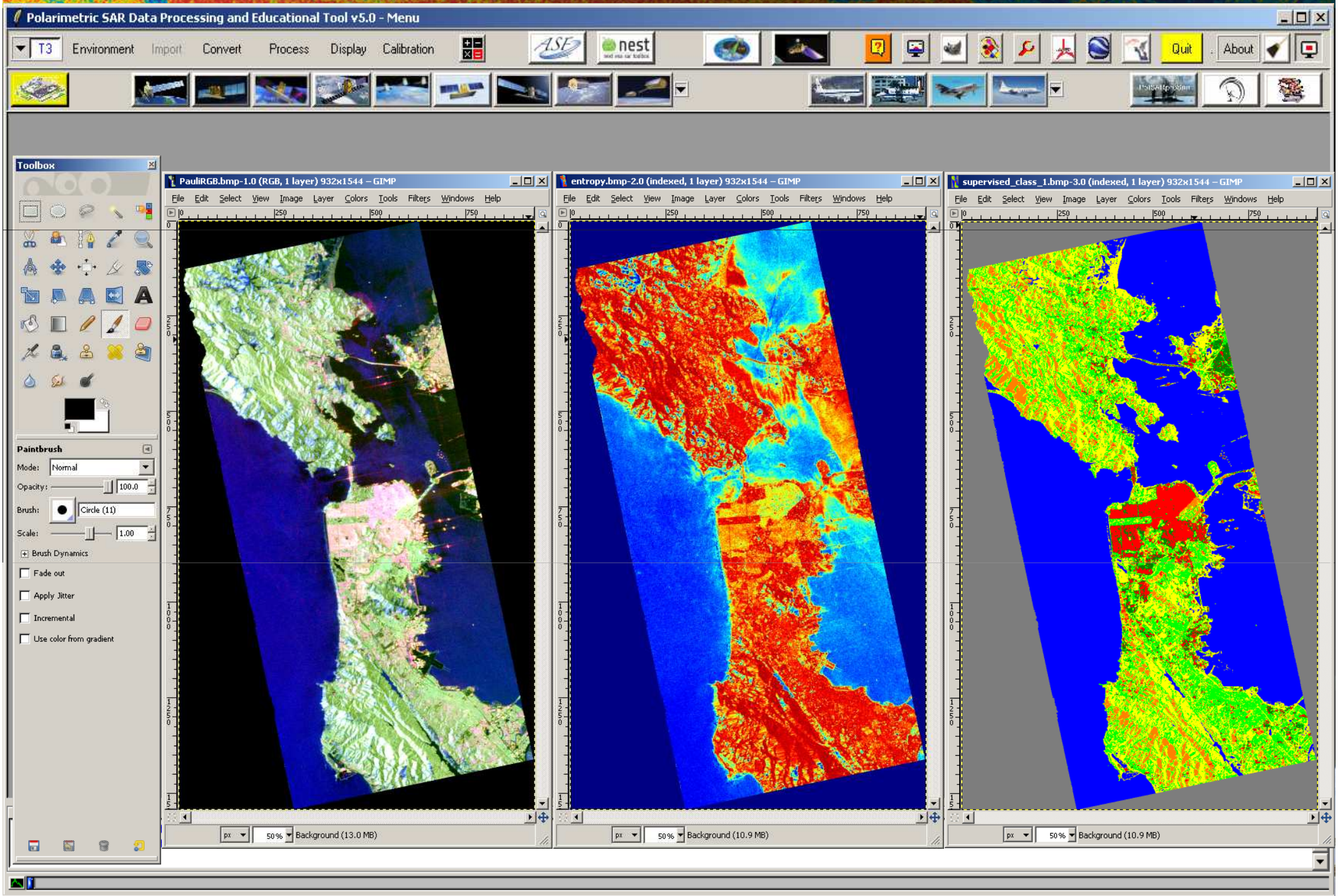
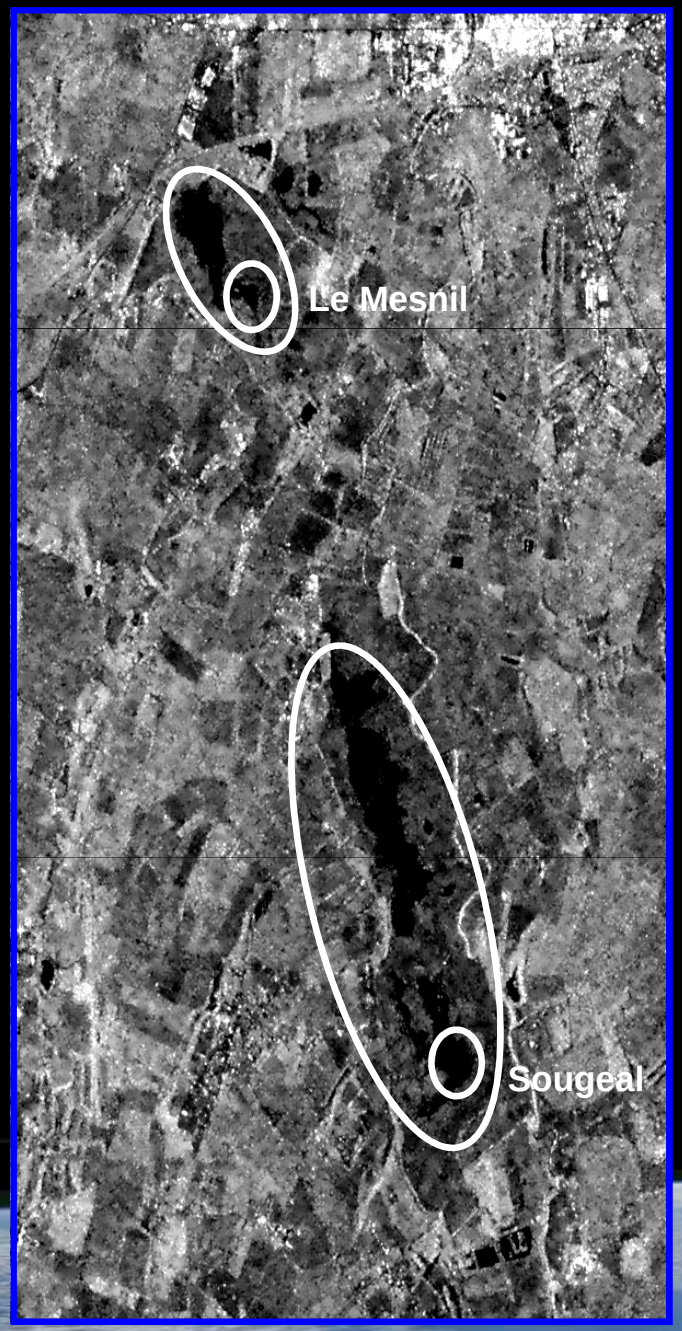
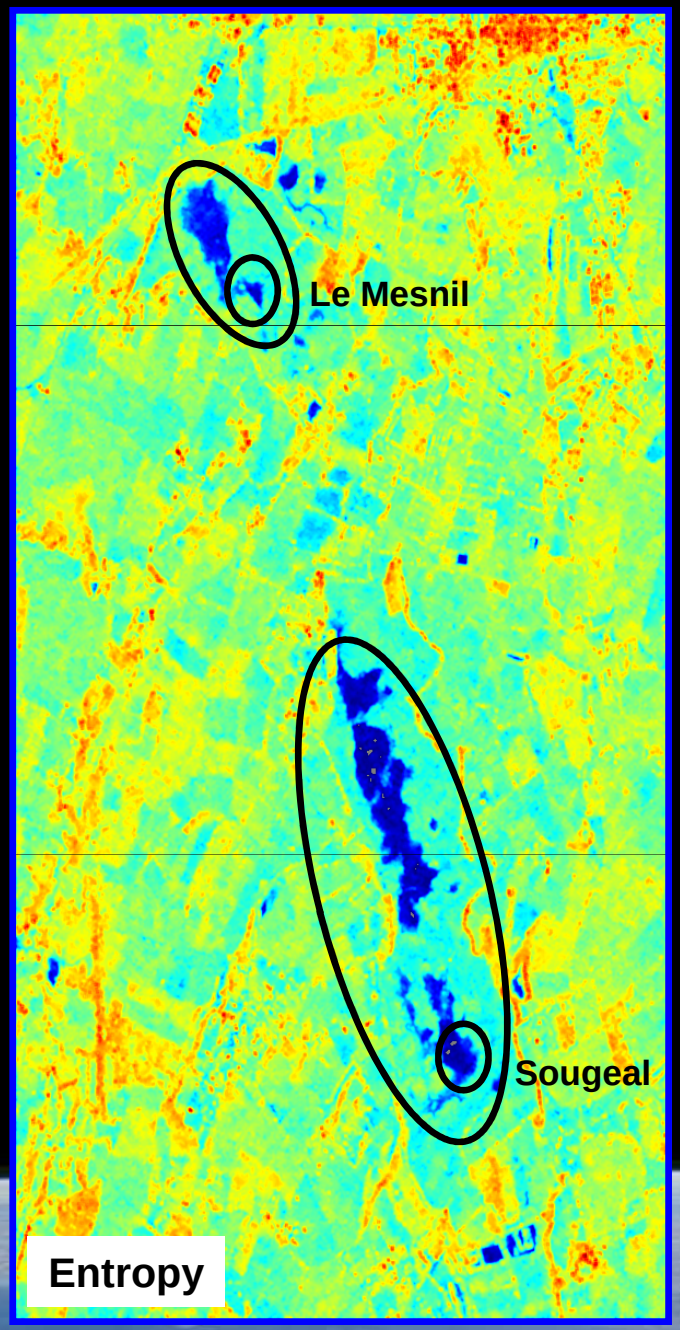

Polarimetric SAR Data Processing and Educational Tool v5.0 - Menu
T3
Environment
Import
Convert
Process
Display
Calibration
Quit
About
Toolbox
Paintbrush
Mode: Normal
Opacity: 100.0
Brush: Circle (11)
Scale: 1.00
Brush Dynamics
Fade out
Apply Jitter
Incremental
Use color from gradient
PauliRGB.bmp-1.0 (RGB, 1 layer) 932x1544 – GIMP
entropy.bmp-2.0 (indexed, 1 layer) 932x1544 – GIMP
supervised_class_1.bmp-3.0 (indexed, 1 layer) 932x1544 – GIMP
File Edit Select View Image Layer Colors Tools Filters Windows Help
50% Background (13.0 MB)
50% Background (10.9 MB)
50% Background (10.9 MB)

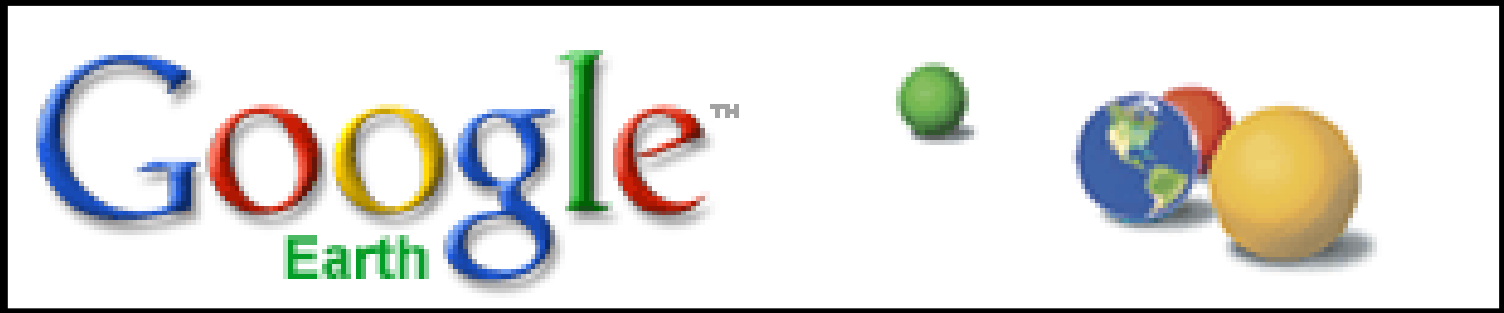
IMAGE MAGICK

IMAGE MAGICK

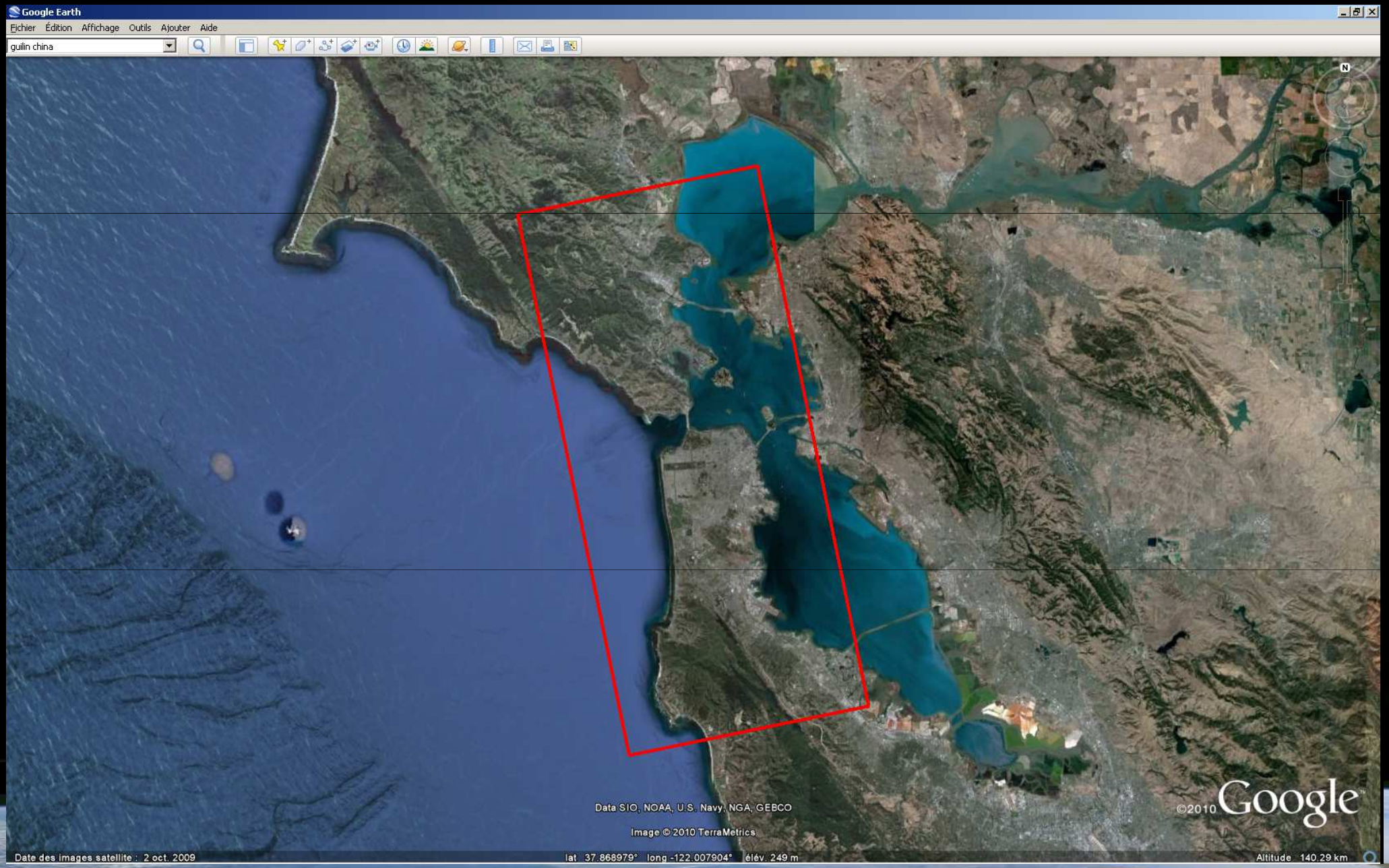




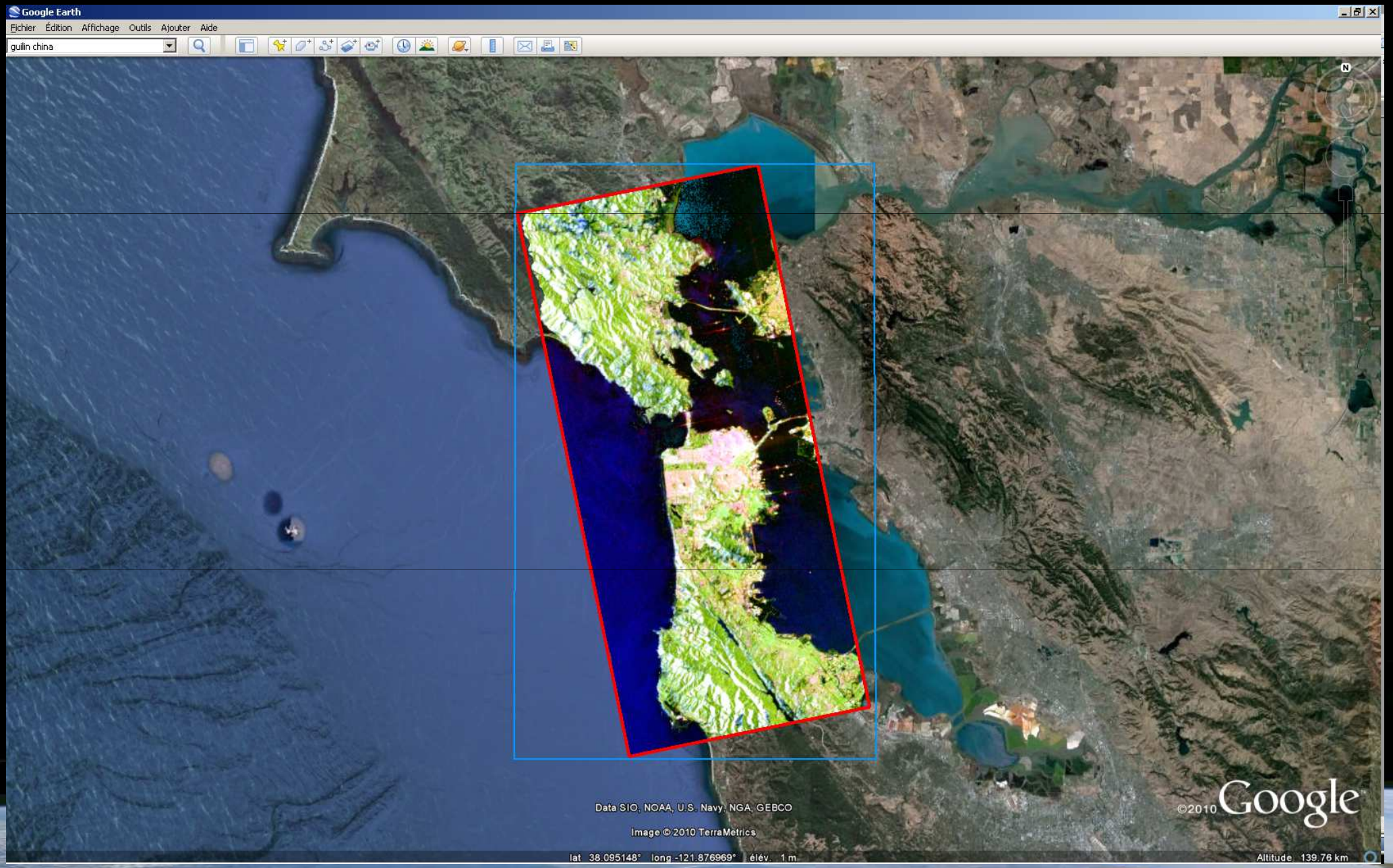
GOOGLE EARTH



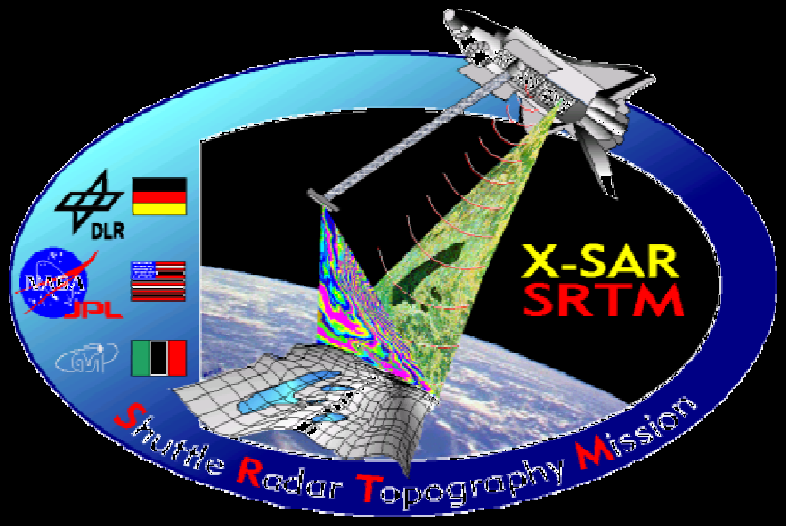
GOOGLE EARTH



GOOGLE EARTH



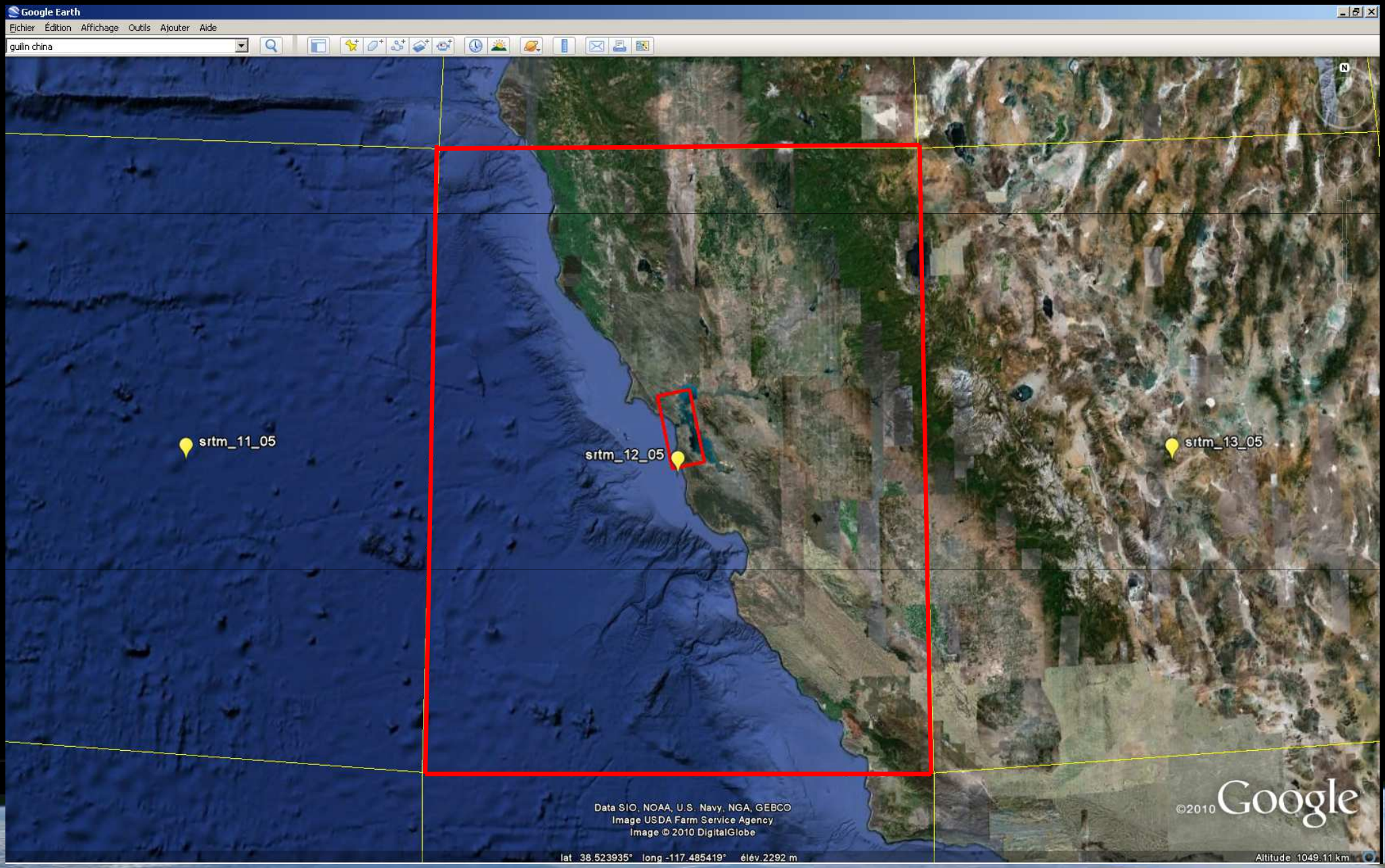
S.R.T.M - ASTER



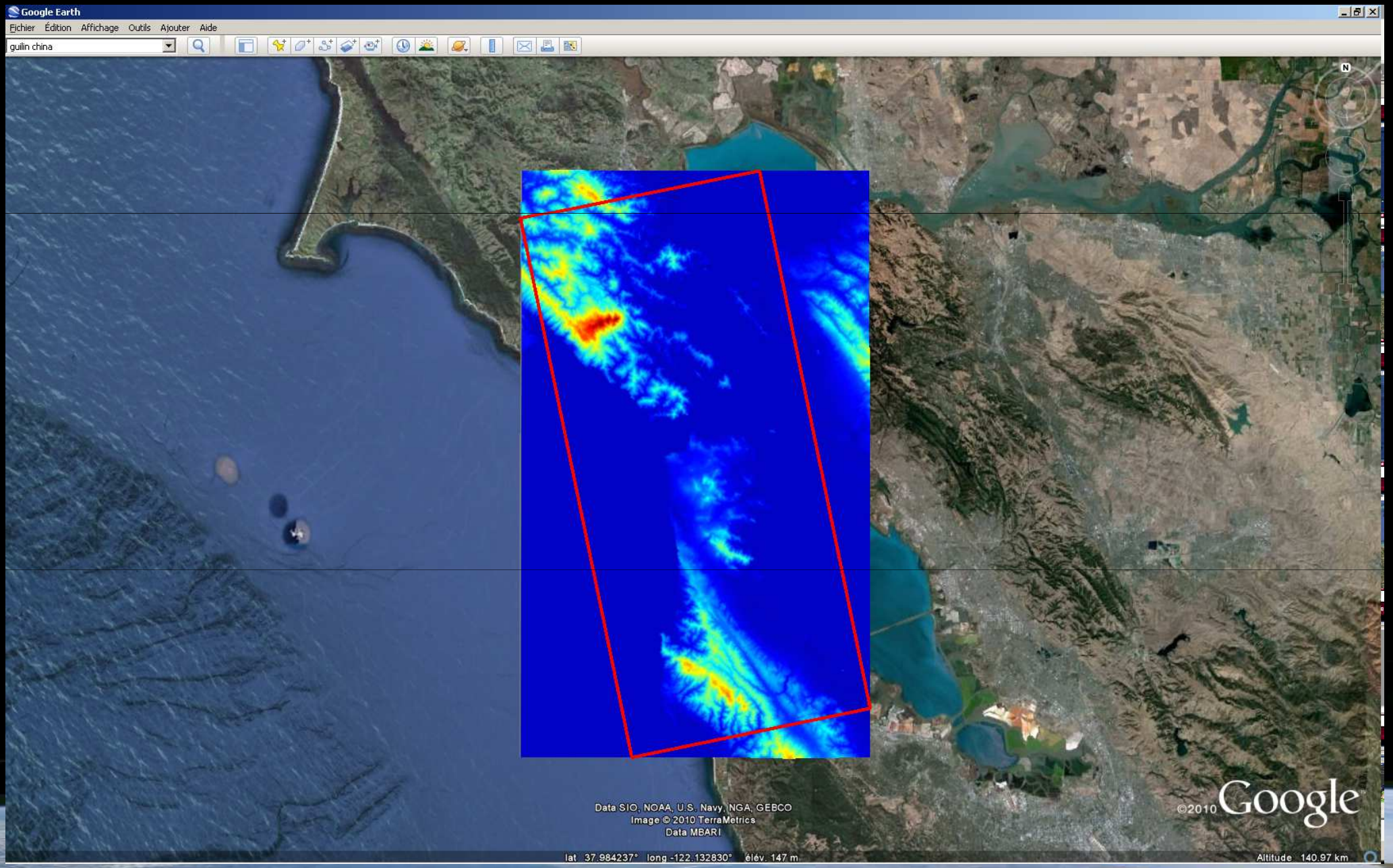
ASTER

Advanced Spaceborne Thermal Emission and Reflection Radiometer

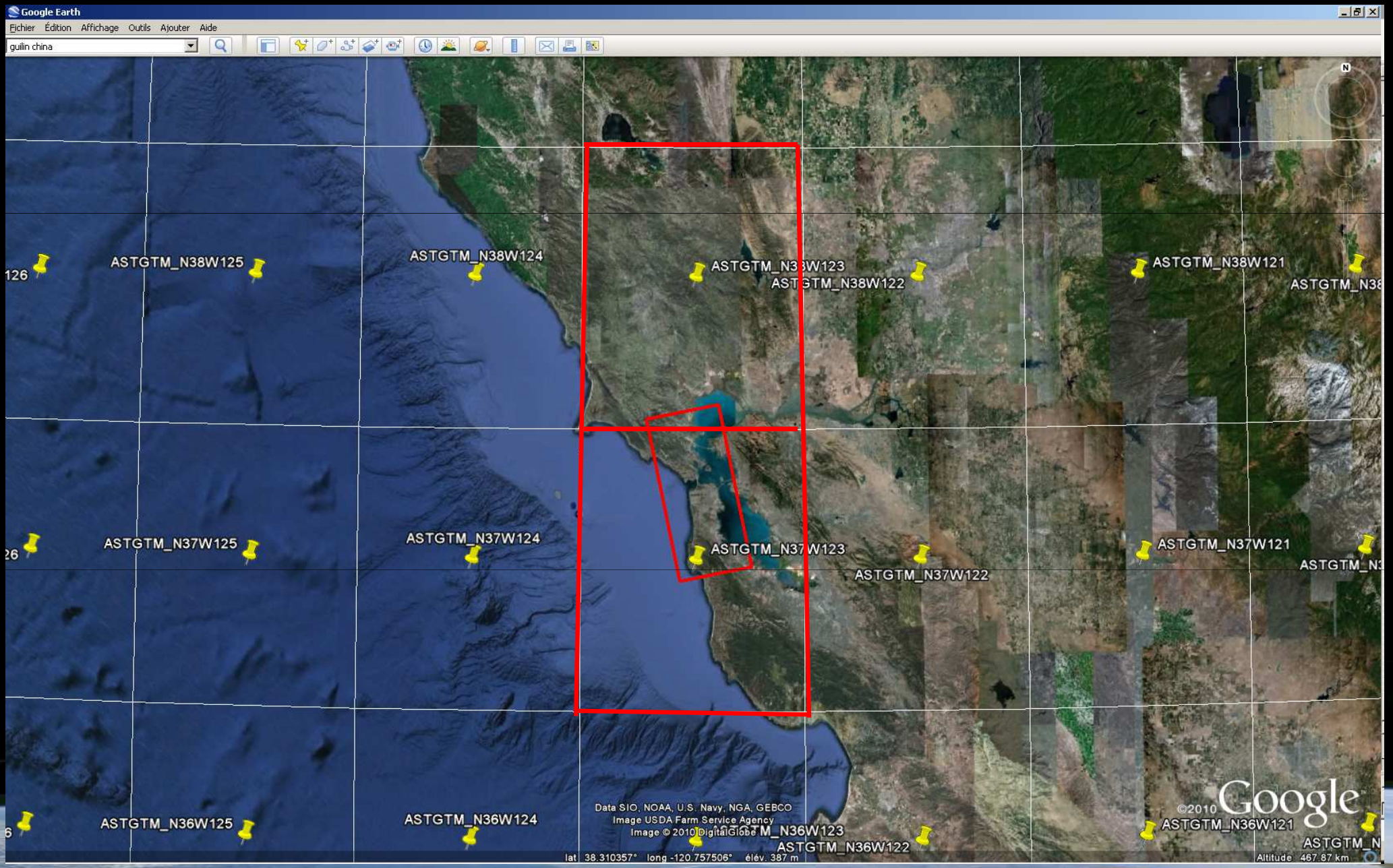
S.R.T.M


Google Earth
Fichier Édition Affichage Outils Ajouter Aide
guilin china
srtm_11_05
srtm_12_05
srtm_13_05
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image USDA Farm Service Agency
Image © 2010 DigitalGlobe
©2010 Google
lat 38.523935° long -117.485419° élév.2292 m
Altitude 1049.11 km

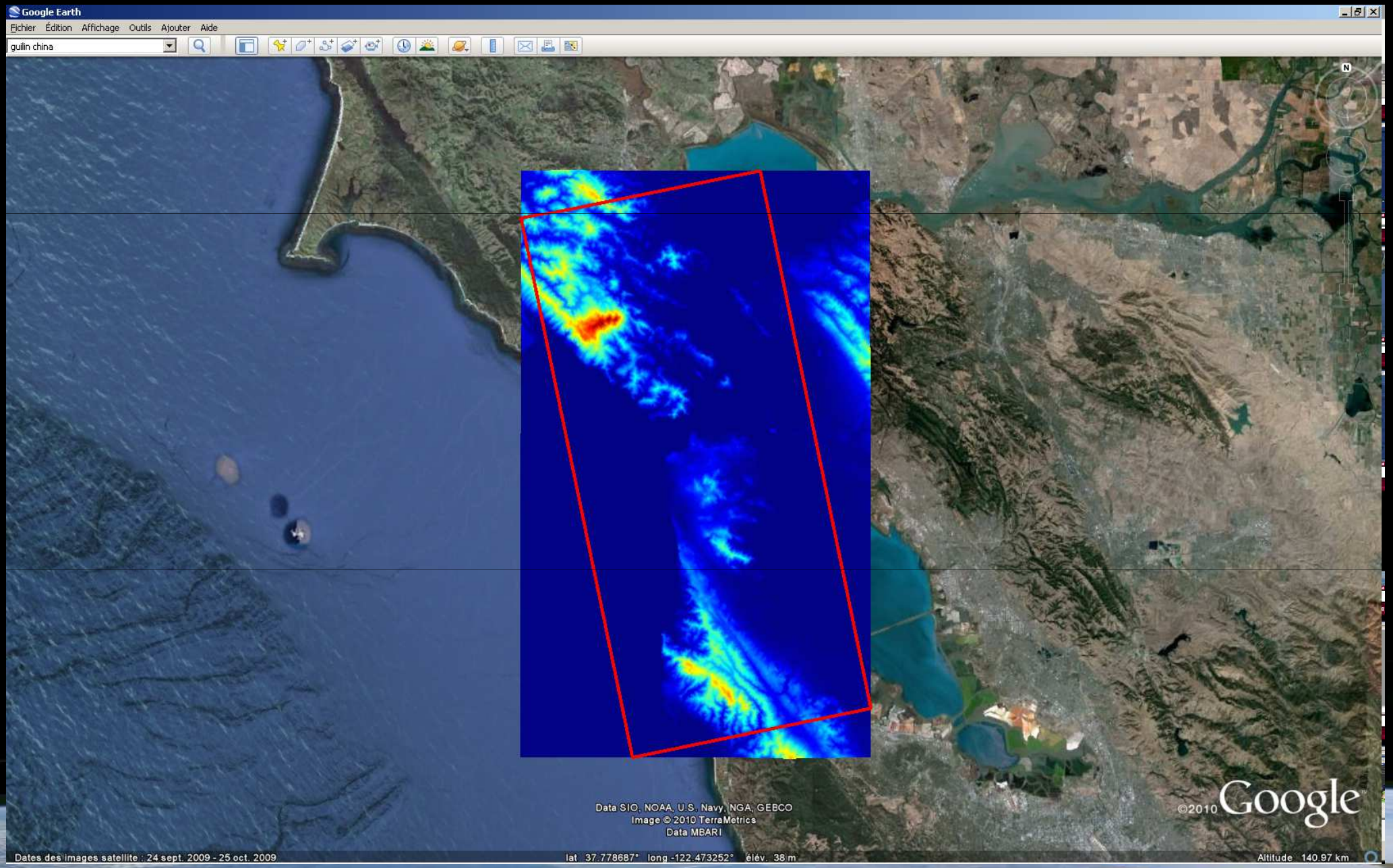
S.R.T.M


Google Earth
Fichier Édition Affichage Outils Ajouter Aide
guilin china
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2010 TerraMetrics
Data MBARI
©2010 Google
lat 37.984237° long -122.132830° élév. 147 m
Altitude 140.97 km

ASTER


Google Earth
Fichier Édition Affichage Outils Ajouter Aide
guilin china
ASTGTM_N38W125
ASTGTM_N38W124
ASTGTM_N38W123
ASTGTM_N38W122
ASTGTM_N38W121
ASTGTM_N37W125
ASTGTM_N37W124
ASTGTM_N37W123
ASTGTM_N37W122
ASTGTM_N37W121
ASTGTM_N36W125
ASTGTM_N36W124
ASTGTM_N36W123
ASTGTM_N36W122
ASTGTM_N36W121
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image USDA Farm Service Agency
Image © 2010 DigitalGlobe
©2010 Google
lat 38.310357° long -120.757506° élév. 387 m
Altitude 467.87 km

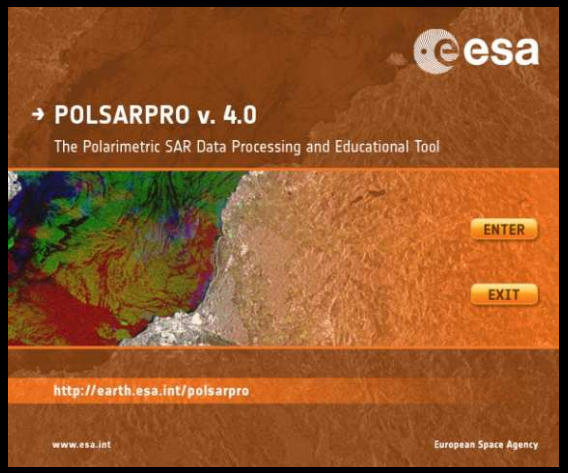
ASTER


Google Earth
Fichier Édition Affichage Outils Ajouter Aide
guilin china
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2010 TerraMetrics
Data MBARI
©2010 Google
Dates des images satellite : 24 sept. 2009 - 25 oct. 2009
lat 37.778687° long -122.473252° élév. 38 m
Altitude 140.97 km

PolSARpro v5.0 SOFTWARE

GIS SOFTWARES

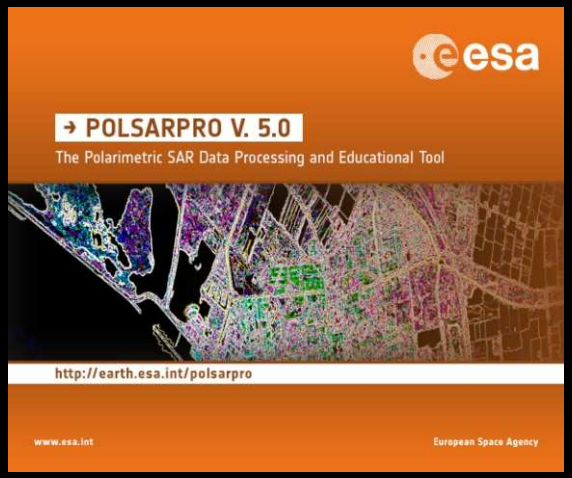
MAP READY



v 4.0

ASF

NEST


esa
→ POLSARPRO V. 5.0
The Polarimetric SAR Data Processing and Educational Tool
http://earth.esa.int/polsarpro
www.esa.int
European Space Agency

New!

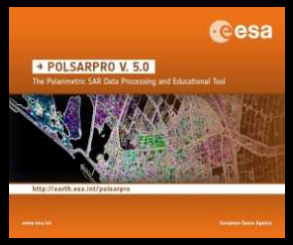

→ SNAP Sentinels Application Platform
Sentinel-1 Toolbox
→ SNAP S-1
→ SNAP RS2
esa
seom
scientific exploitation of operational missions

PolSARpro v5.0 SOFTWARE

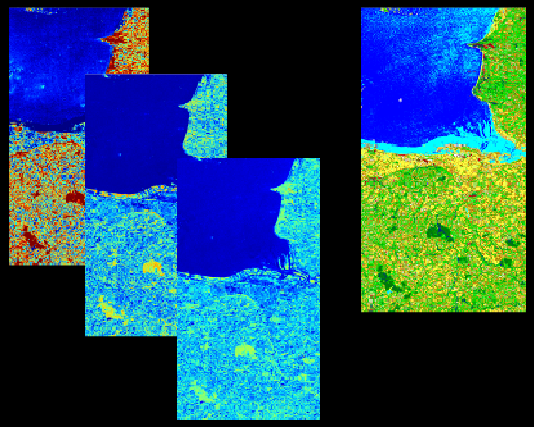
MAP READY - NEST

POLARIMETRIC DATA SETS

Pre-Processing
Data Extract [*T3*]

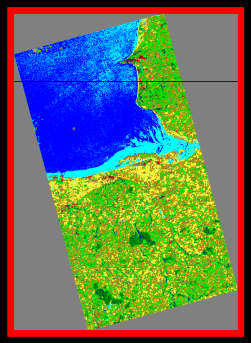


Post-Processing



Speckle Filtering
Polar. Decomposition
Unsupervised Segmentation

Geo-Coding



Terrain Correct
UTM Projection

KML File generation

New!

PolSARpro v5.0 SOFTWARE

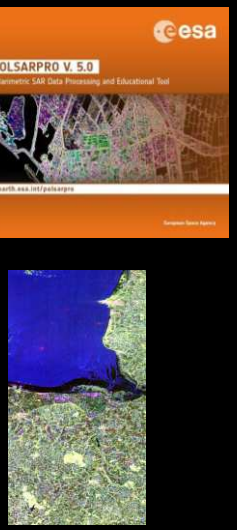
MAP READY - NEST

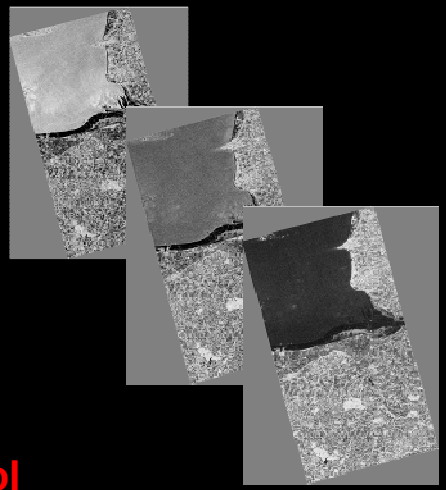
Pre-Processing
Data Extract [*T3*]

Geo-Coding
Terrain Correct - UTM Proj.

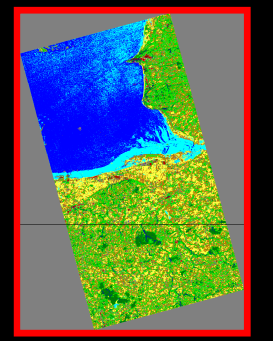
Post - Processing

POLARIMETRIC DATA SETS





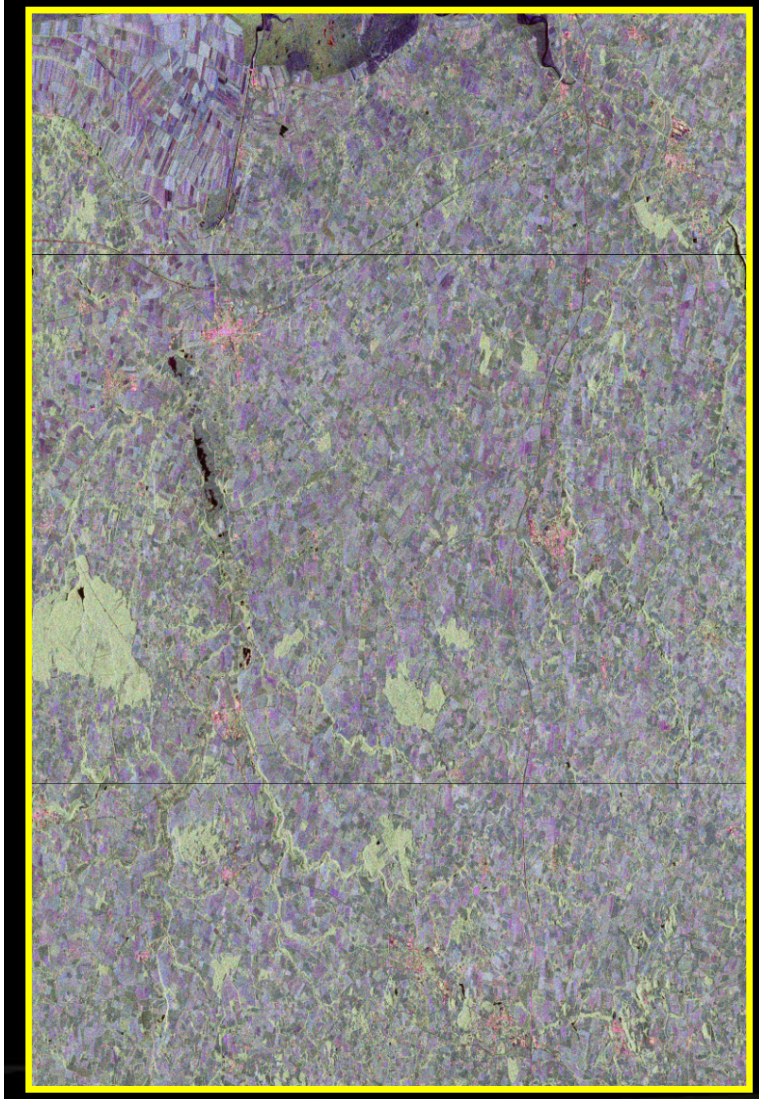
Only valid for:
[C2] matrix: Dual-Pol
[T3] matrix: Quad-Pol



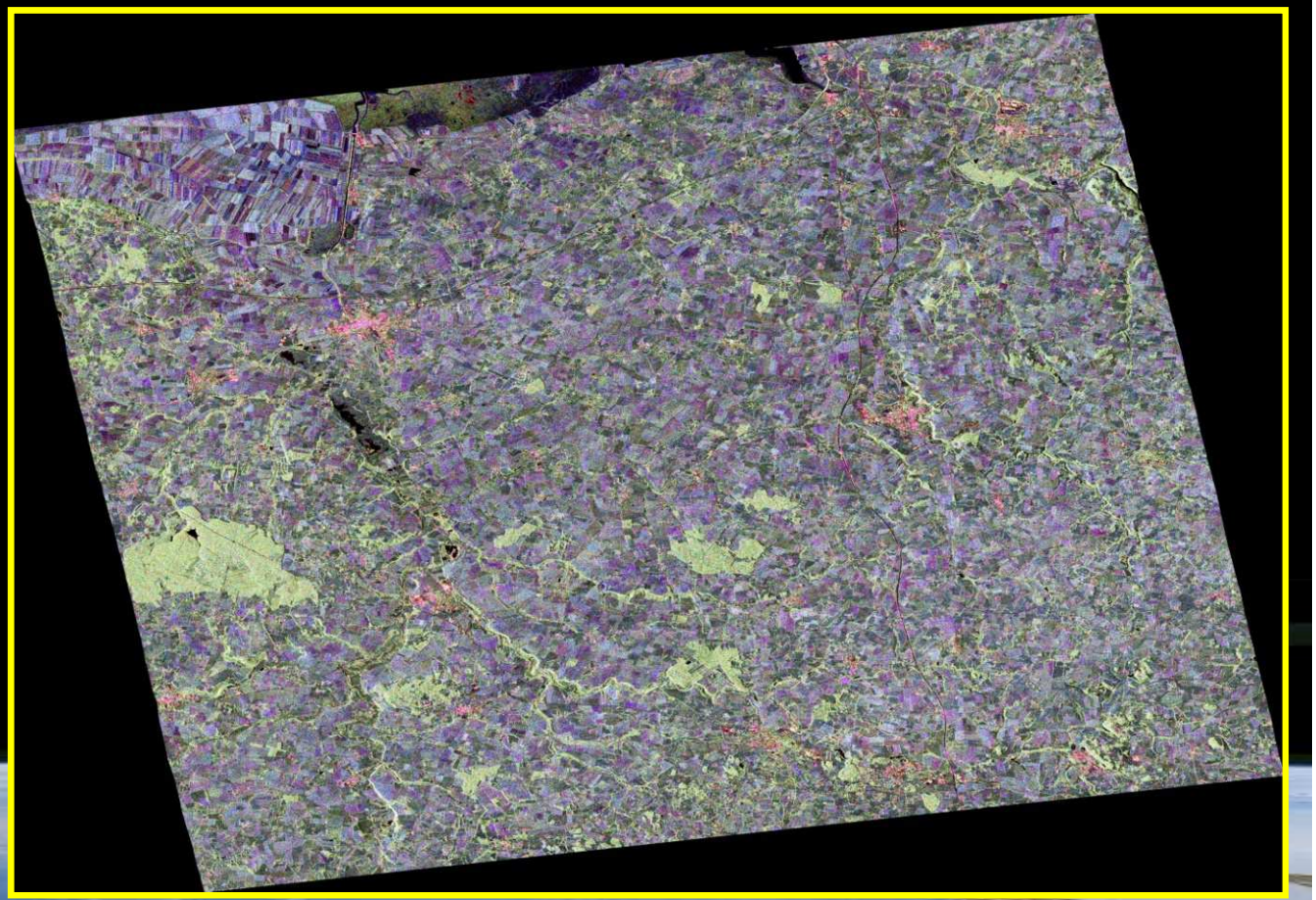
KML File generation

PolSARpro v5.0 SOFTWARE

MAP READY - NEST

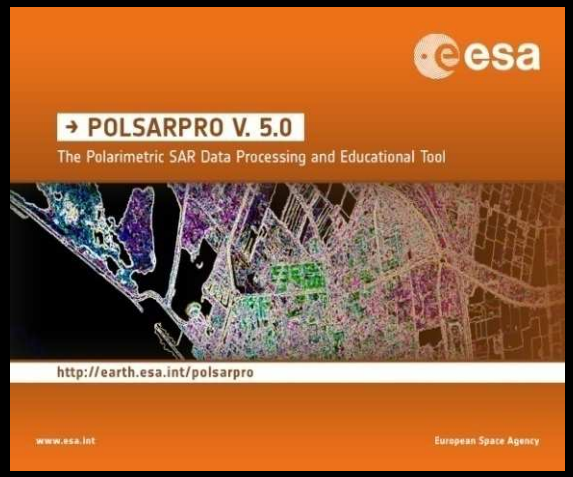


[T3] matrix

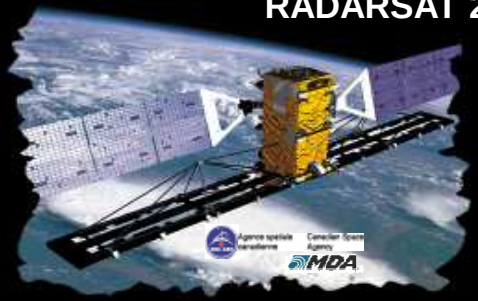


PolSARpro v5.0 SOFTWARE

NEST

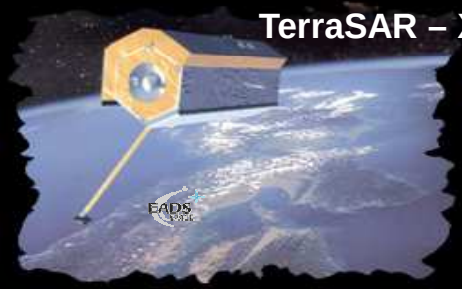


RADARSAT 2



Dual-Pol ([C2])
Quad-Pol ([T3])

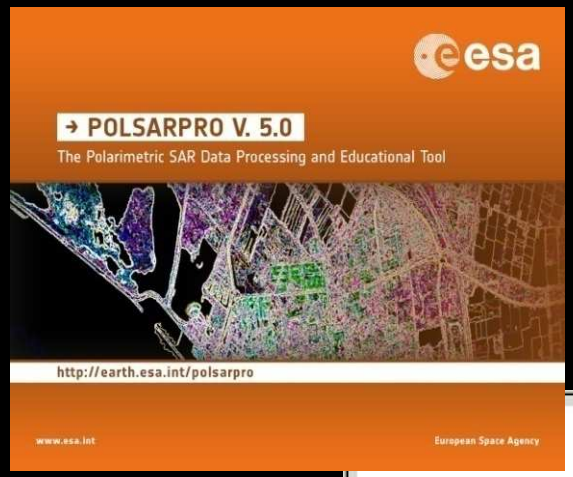
TerraSAR – X



Dual-Pol ([C2])

PolSARpro v5.0 SOFTWARE

MAP READY

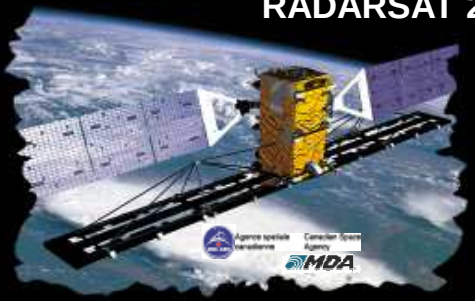


ASF

ALOS – PALSAR

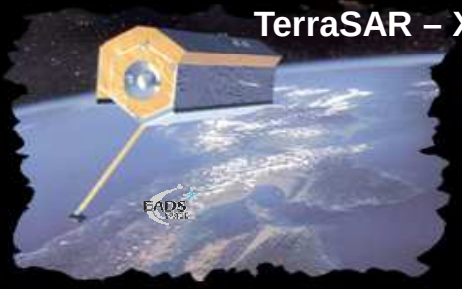
Dual-Pol ([C2])
Quad-Pol ([T3])

RADARSAT 2



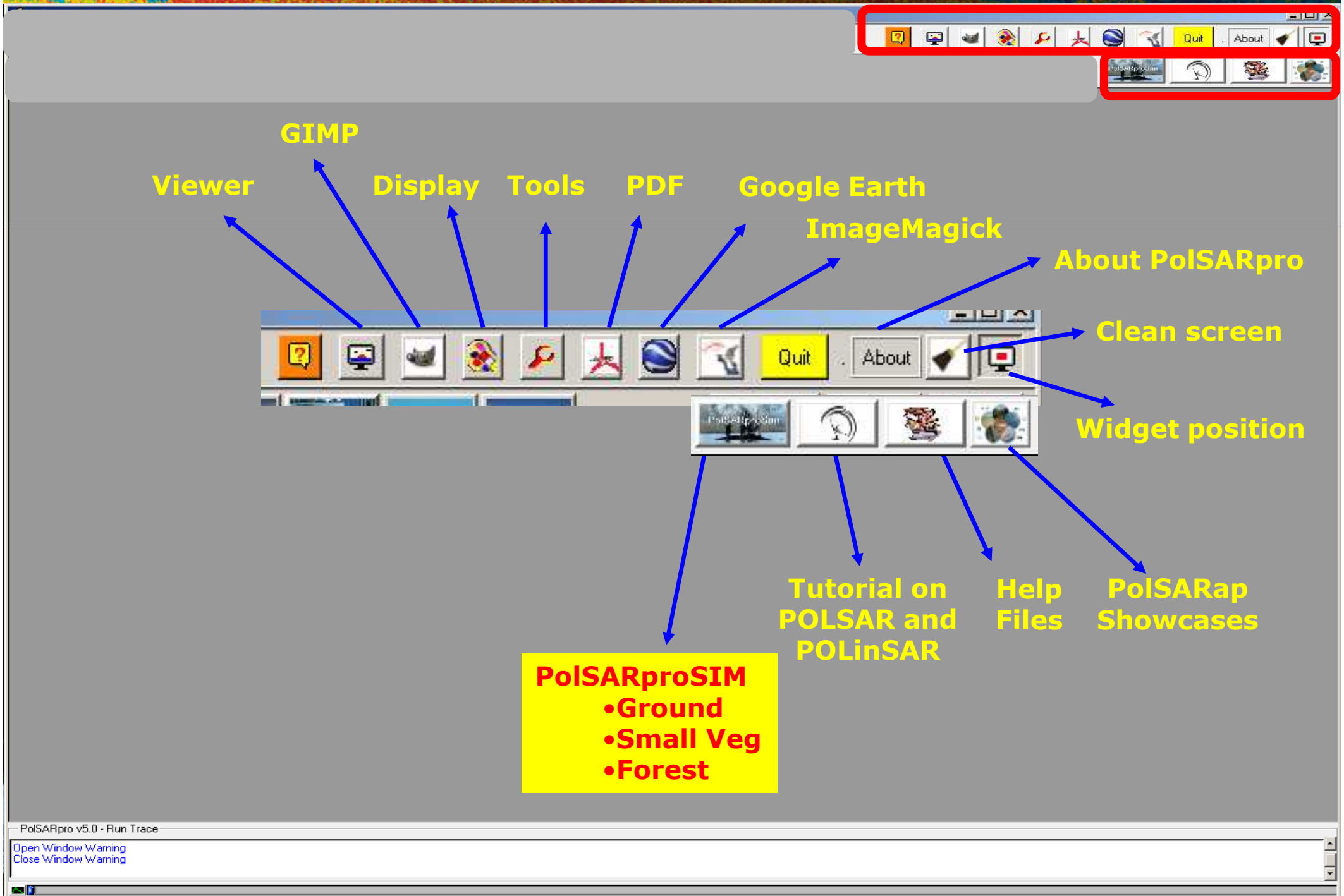
Dual-Pol ([C2])
Quad-Pol ([T3])

TerraSAR – X



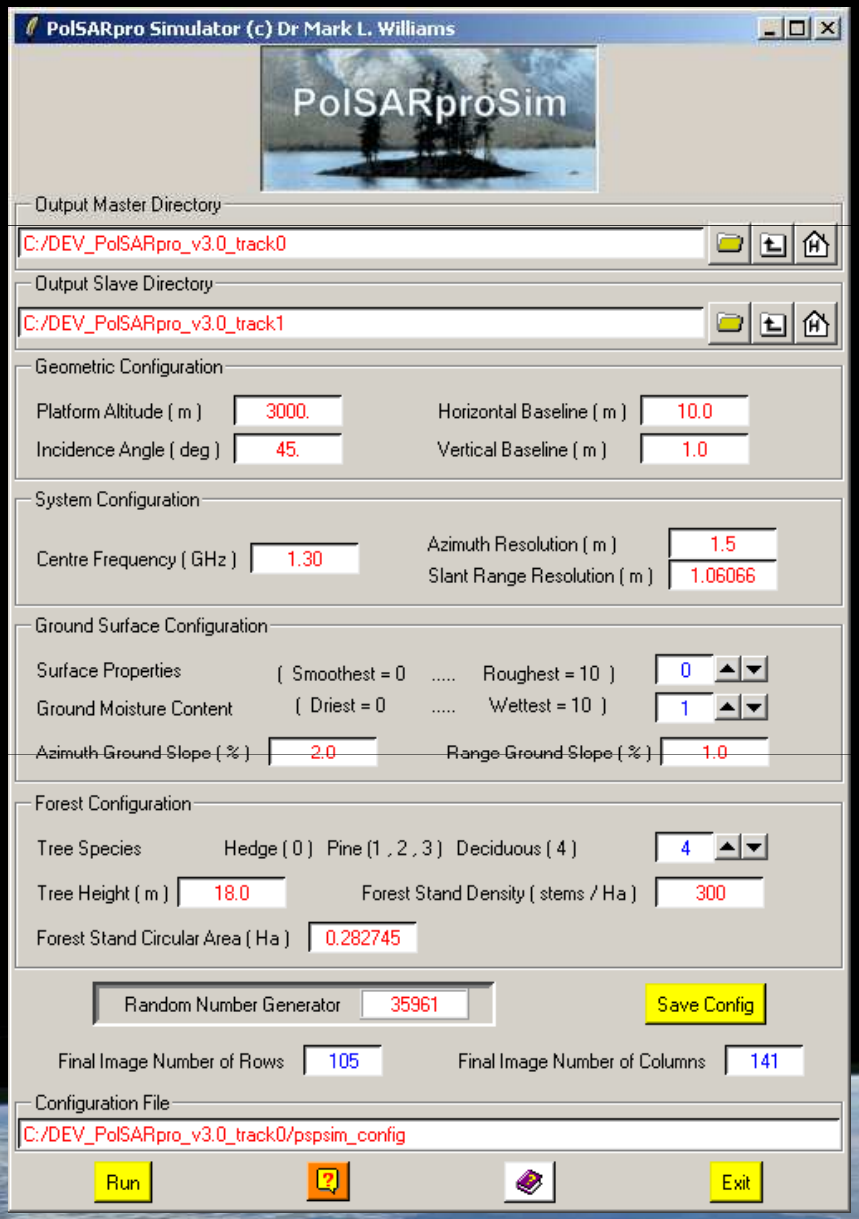
Dual-Pol ([C2])

PolSARpro v5.0 SOFTWARE



PolSARpro – SIM

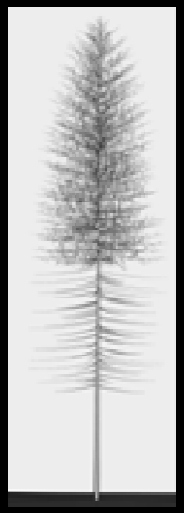
PolSARpro v3.31 SOFTWARE



- **PolSARproSim** is a rapid, coherent, fully polarimetric SAR simulation of forest for demonstrating POLinSAR techniques within **PolSARpro Software v3.31**.
- **PolSARproSim** generates simulated interferometric SAR images of artificial forest scenes that may be analysed as real SAR imagery.
- **SAR properties** and **imaging geometry** are obtained from the user who specifies centre frequency, azimuth and slant range resolutions, along with platform altitude, incidence angle and horizontal and vertical interferometric baselines.
- **Ground surface generation** is controlled by specifying the surface properties slope, roughness and wetness (on simple sliding scales) and **forest properties** (species, height, stand density and stand area).

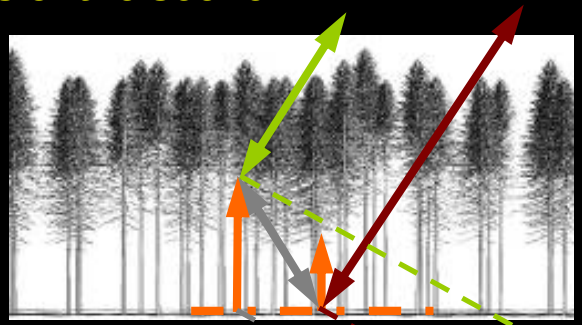
PolSARpro – SIM

The SAR image is evaluated as a coherent sum of scattering events from small elements of the scene



PINE

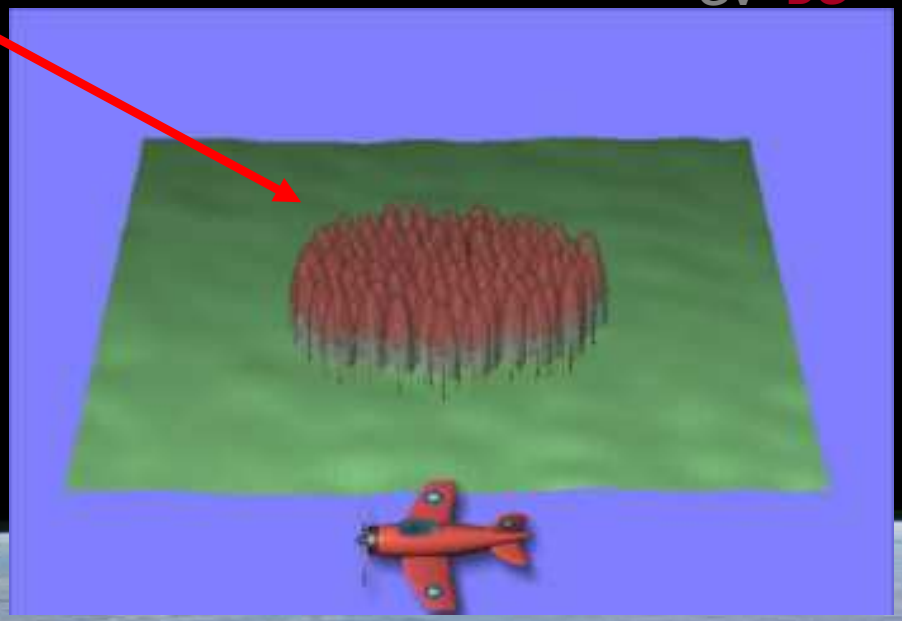
DECIDUOUS



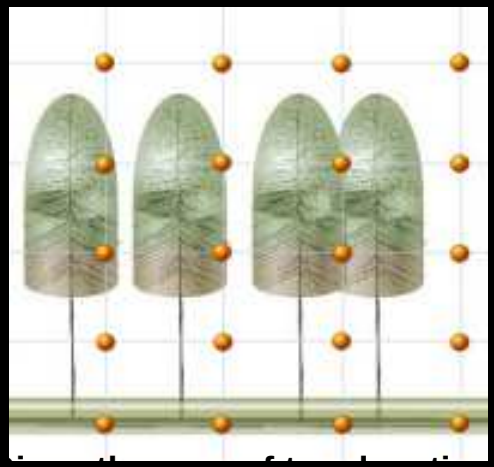
Direct-Ground, Direct-Volume and Ground-Volume contributions are included, with both trees and short vegetation comprising Volume terms.

RANDOM HEDGE

GV DG

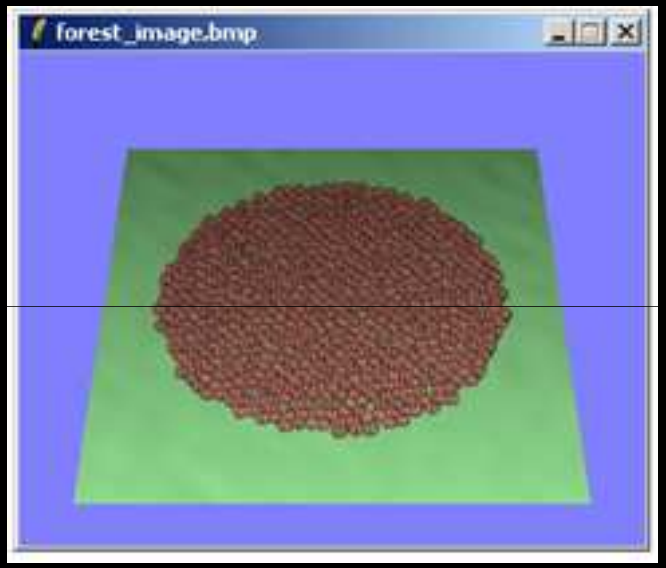


DV

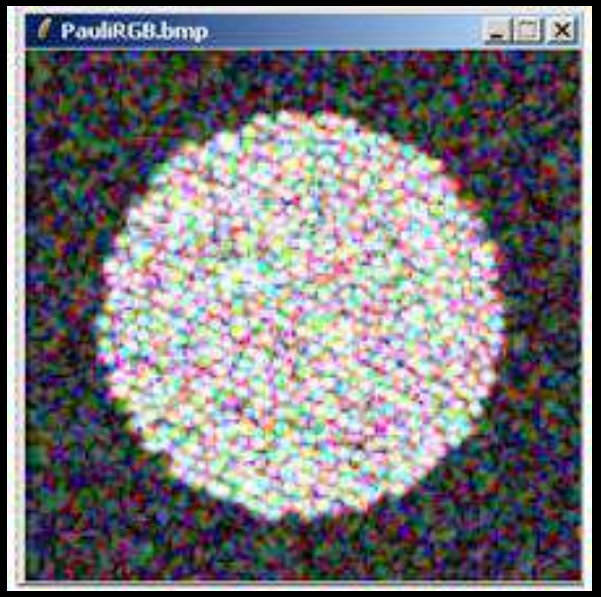


and dimensions a grid of points is used to sample the attenuation of the coherent wave in 3D

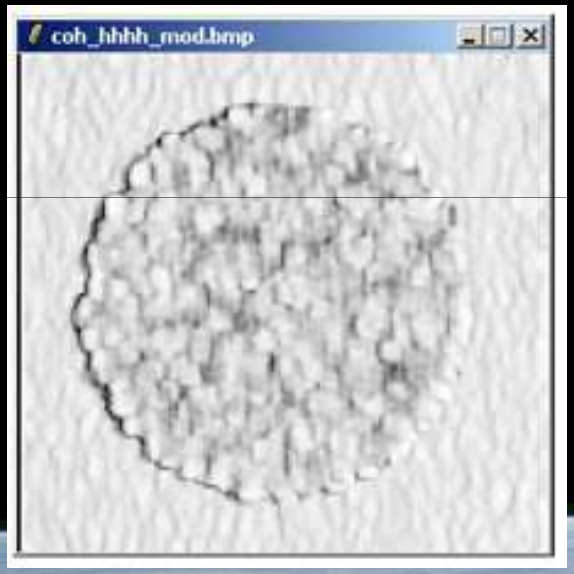
PolSARpro – SIM

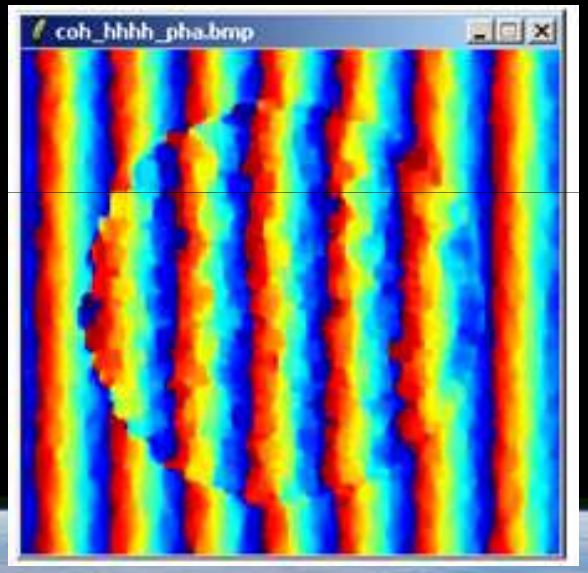


View from Radar



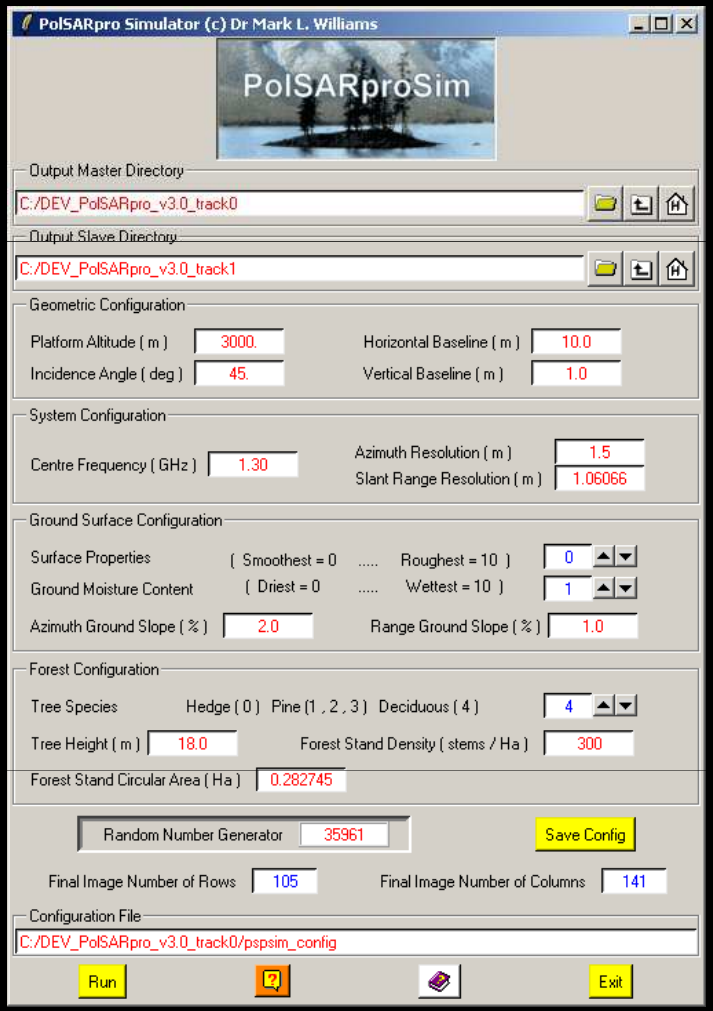
Pauli RGB Image

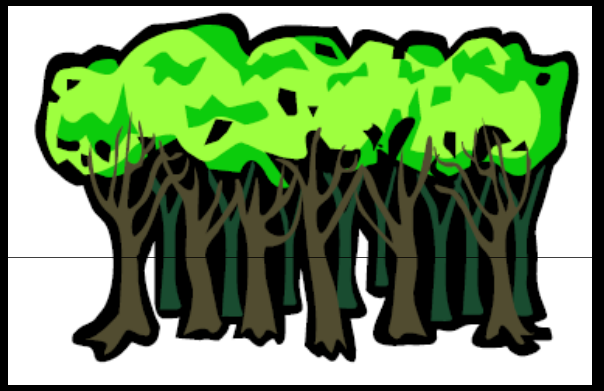




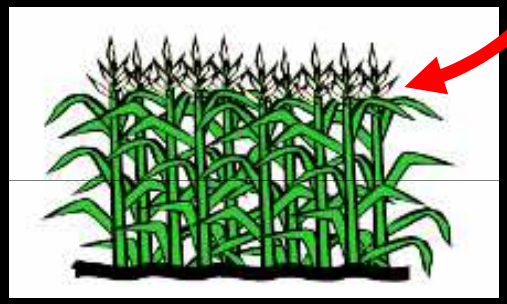
Coherence Map using a 5x5 window – Magnitude (left) and Phase (right)

PolSARpro Simulators

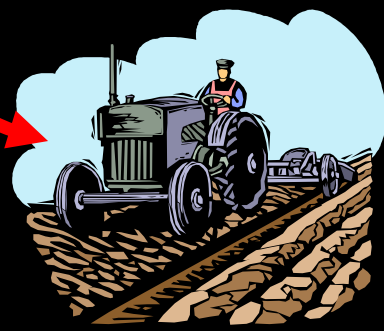




PolSARproSIM

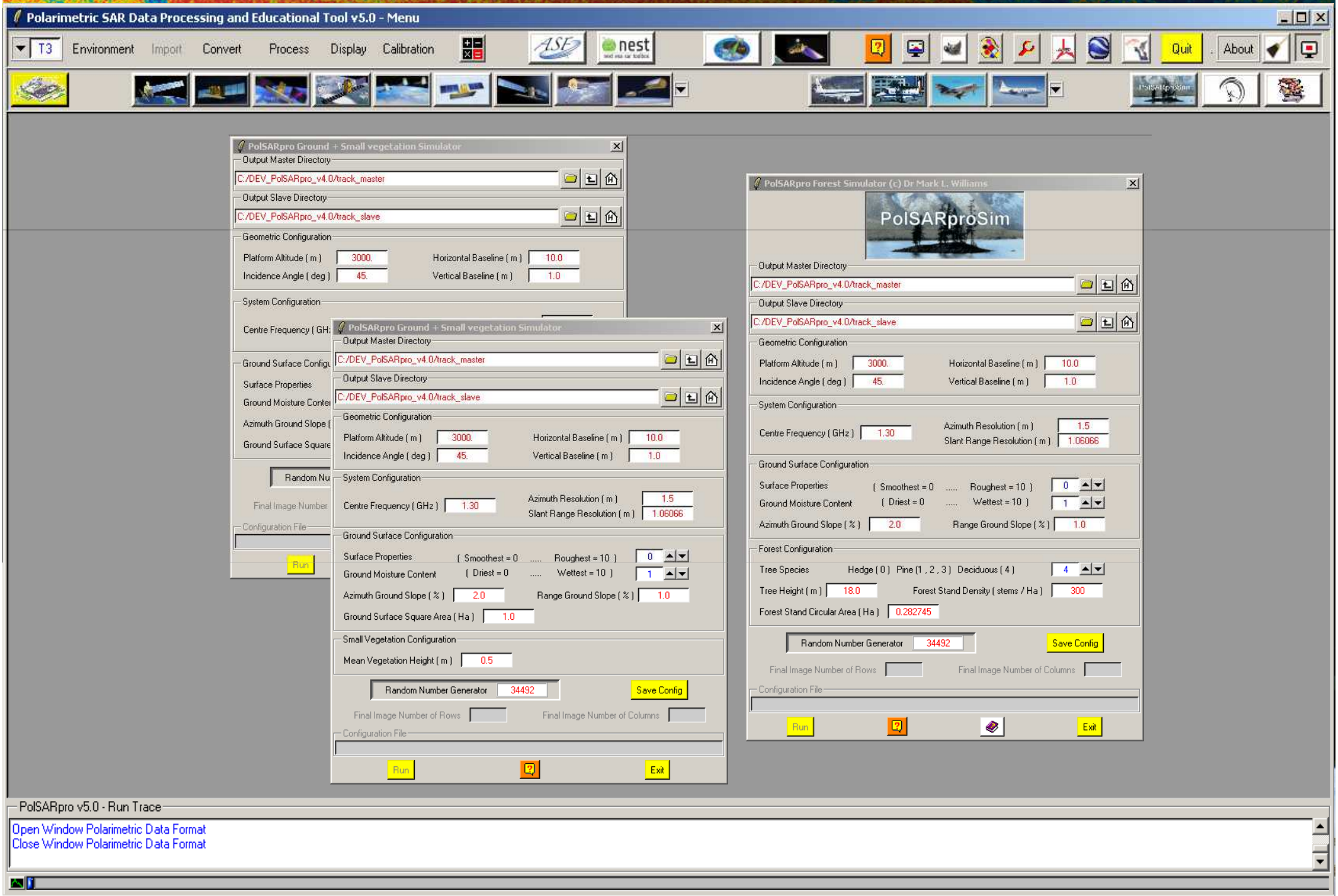


PolSARproSIM_Veg

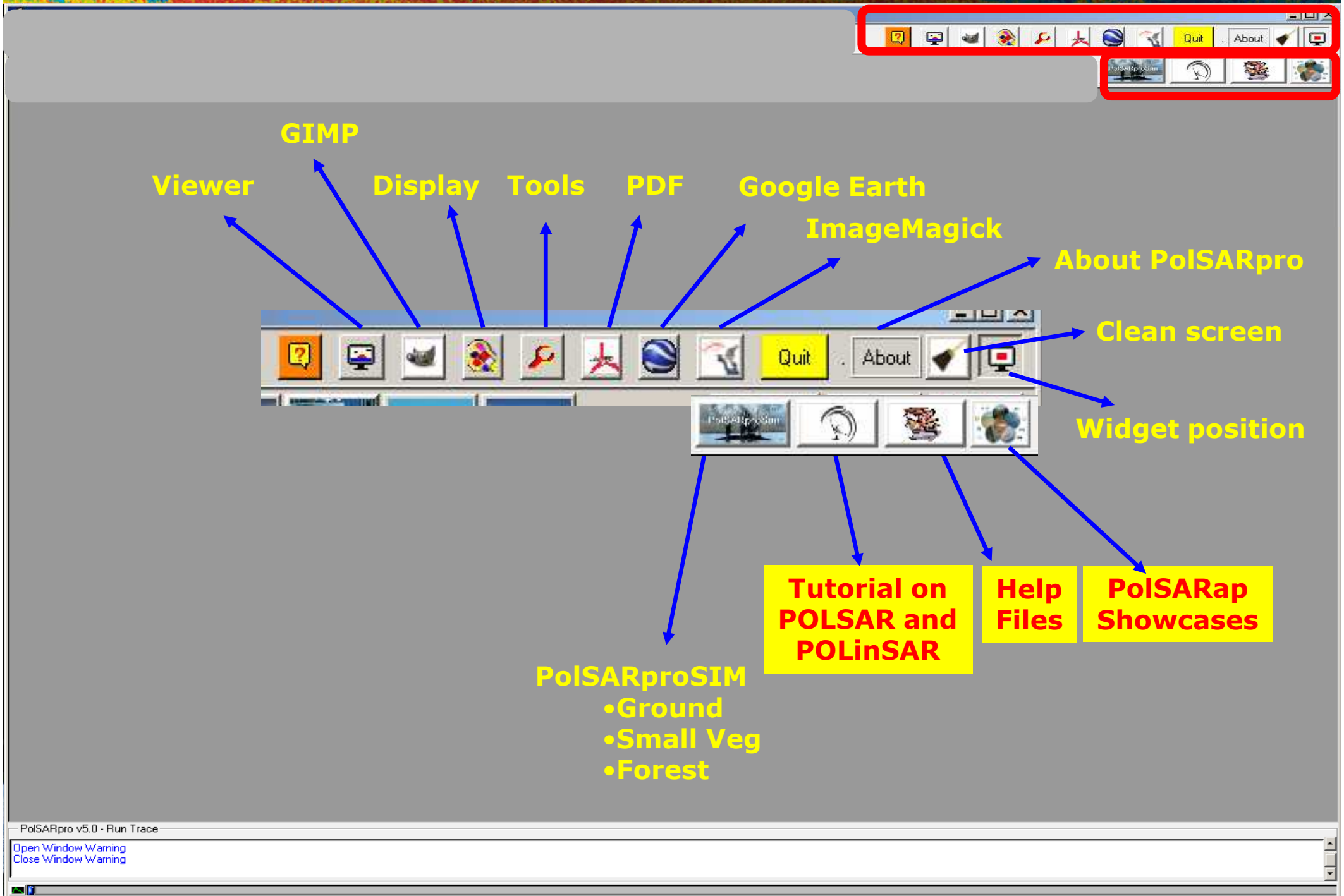


PolSARproSIM_Grd

PolSARpro Simulators



PolSARpro v5.0 SOFTWARE

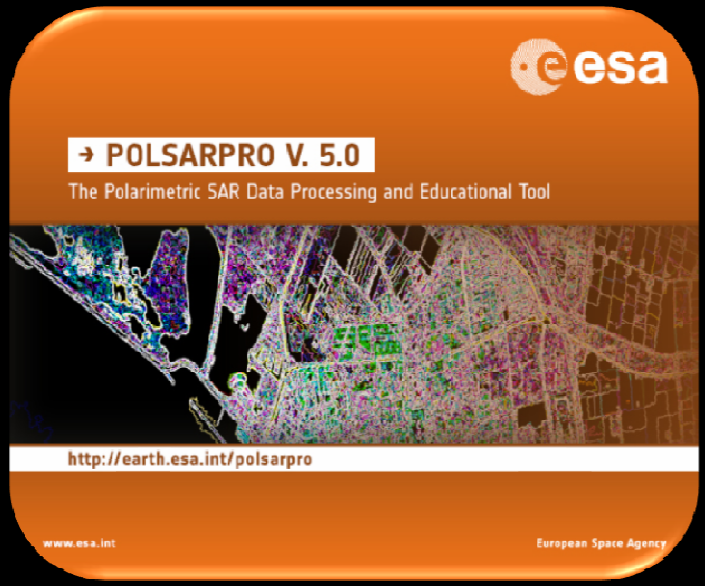


PolSARpro v5.0 SOFTWARE

Learning / Training Next P.I Generations

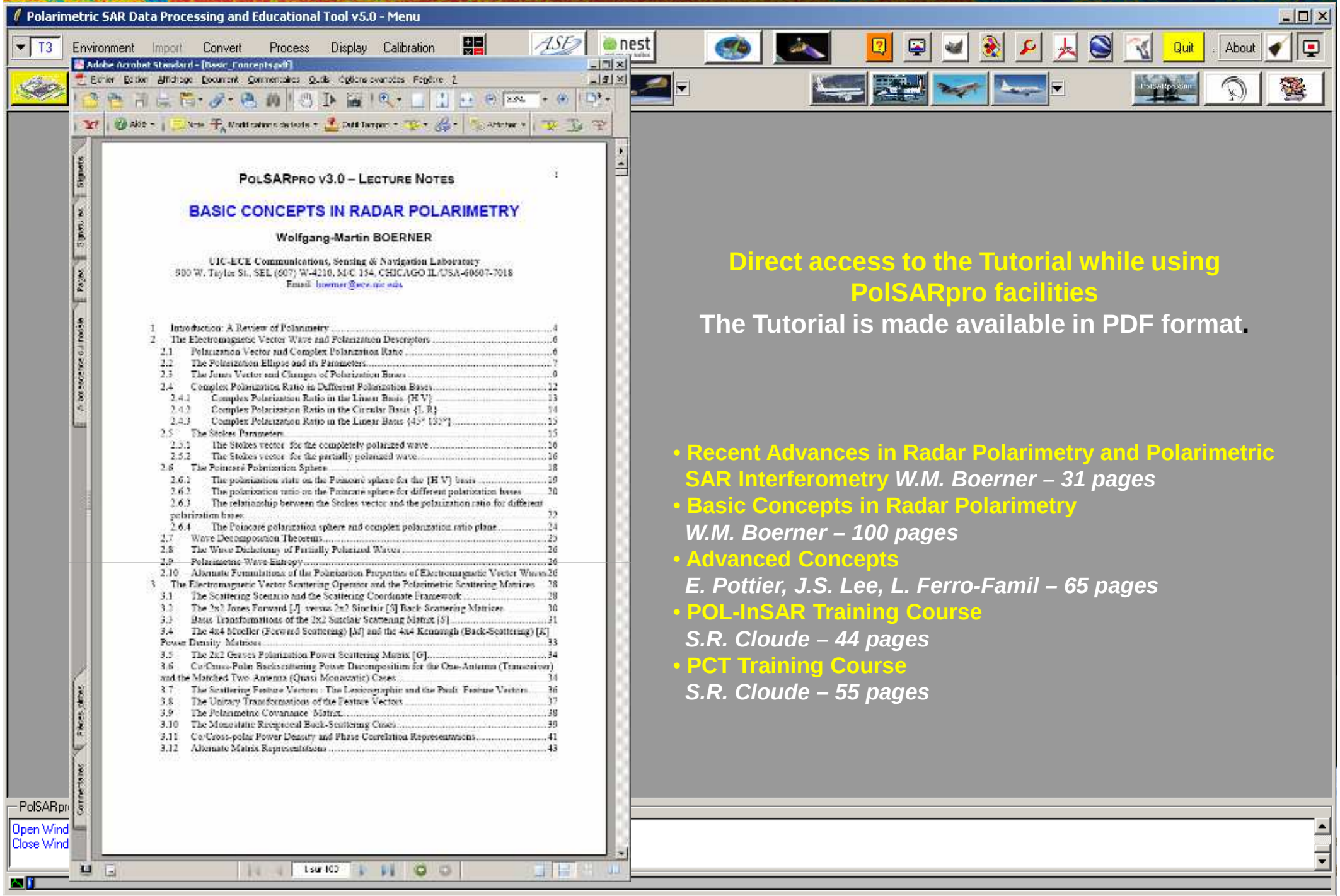
PolSARpro v5.0 SOFTWARE

PolSAR-Ap



PolSARpro

Educational Tools

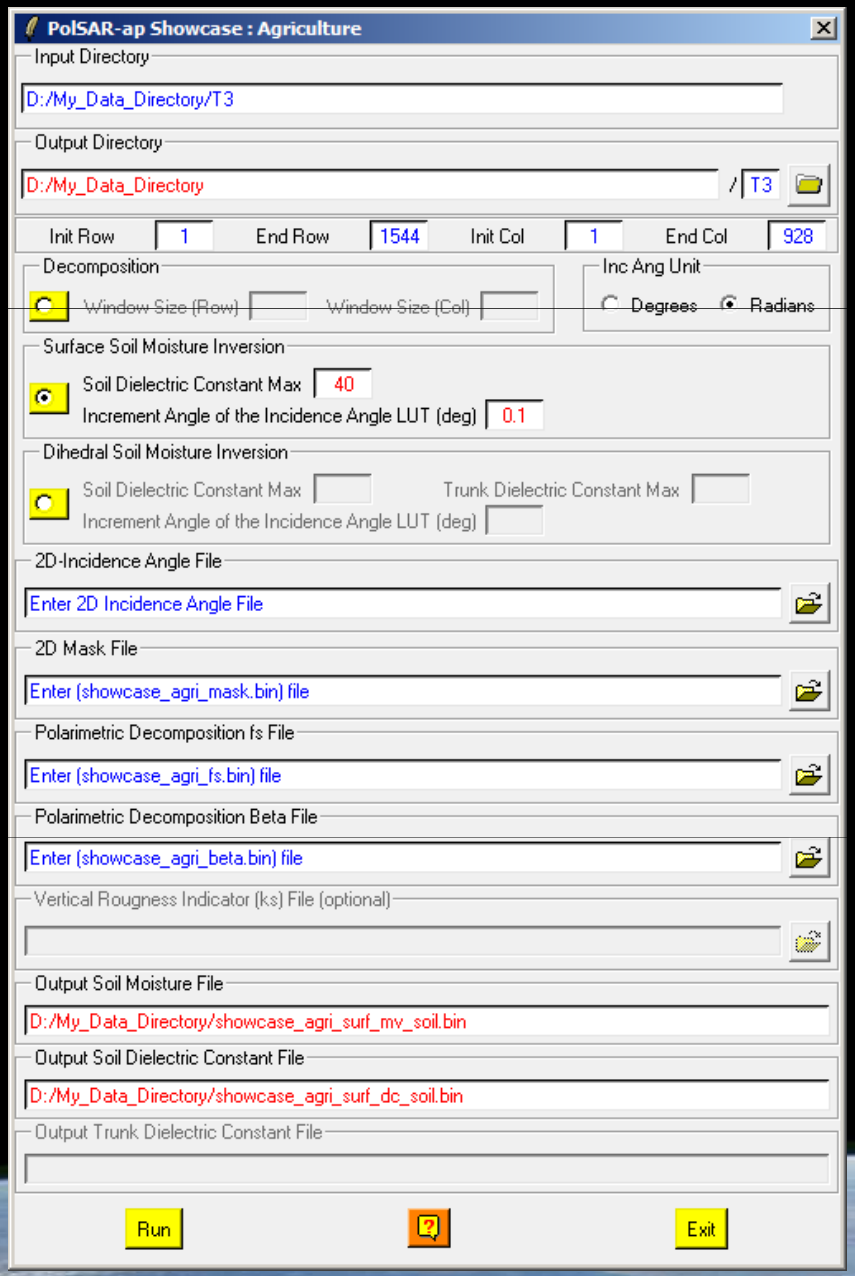


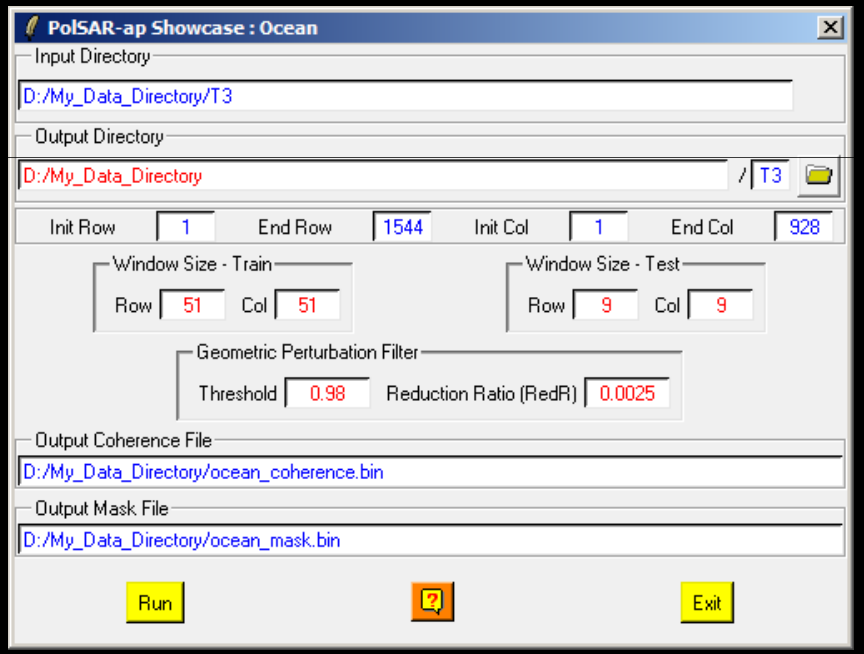
Direct access to the Tutorial while using PolSARpro facilities

The Tutorial is made available in PDF format.

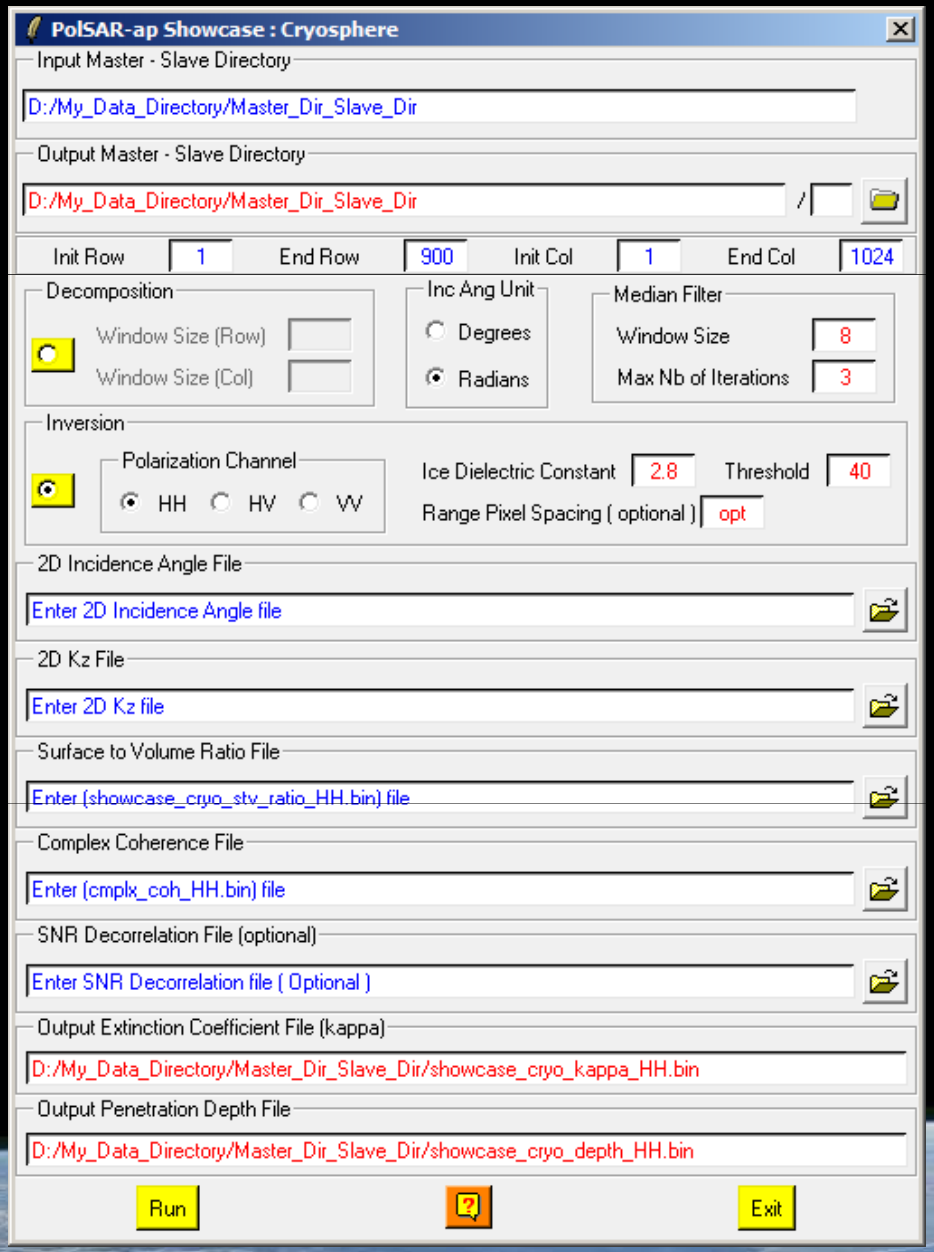
- **Recent Advances in Radar Polarimetry and Polarimetric SAR Interferometry** *W.M. Boerner – 31 pages*
- **Basic Concepts in Radar Polarimetry** *W.M. Boerner – 100 pages*
- **Advanced Concepts** *E. Pottier, J.S. Lee, L. Ferro-Famil – 65 pages*
- **POL-InSAR Training Course** *S.R. Cloude – 44 pages*
- **PCT Training Course** *S.R. Cloude – 55 pages*

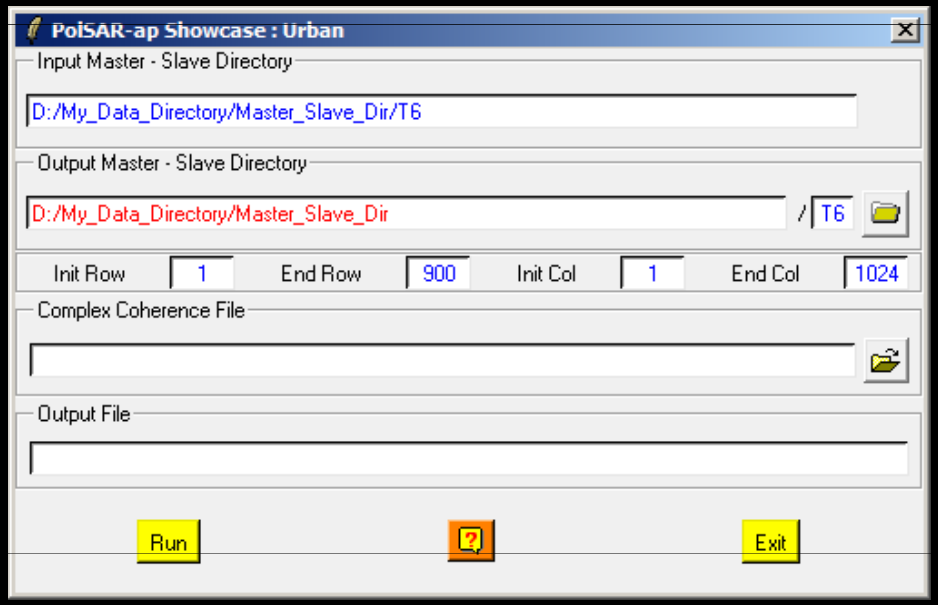
Educational Tools





Educational Tools

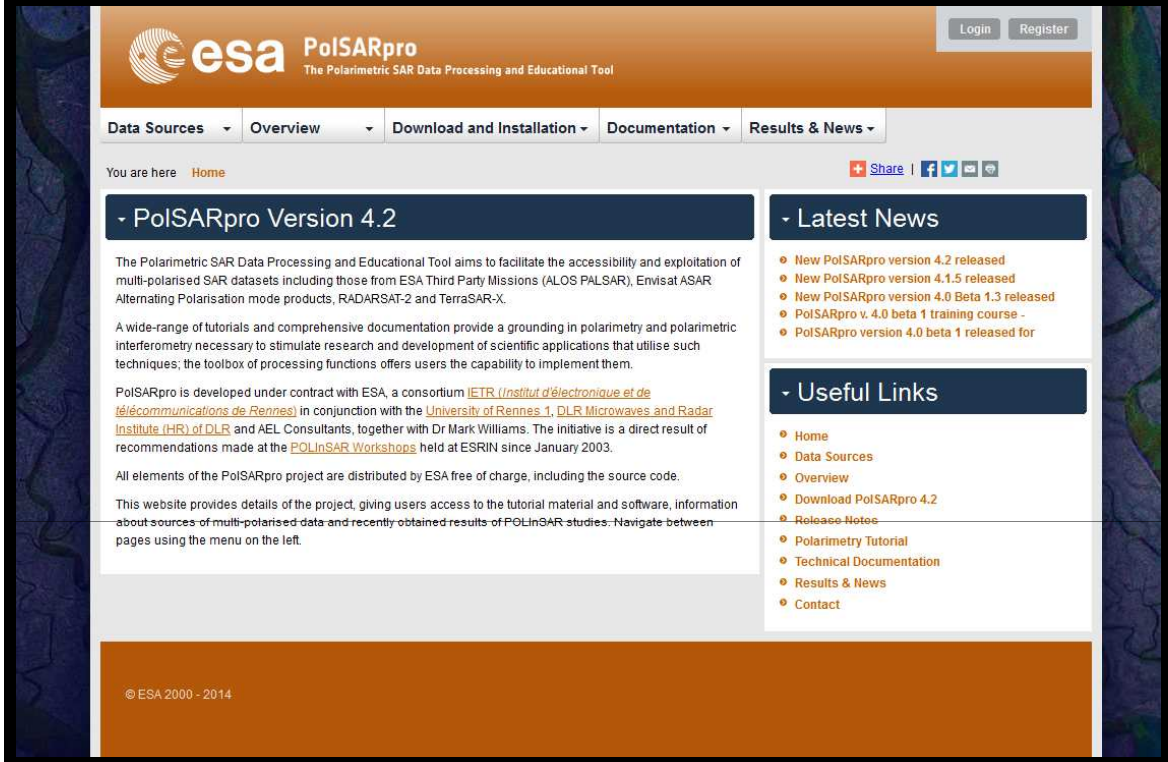




PolSARpro v5.0 SOFTWARE

http://earth.esa.int/web/polsarpro

The Web Site provides

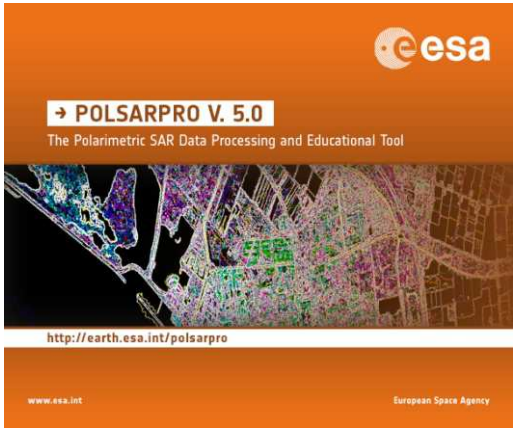


- **Details of the project**
- **Access to the tutorial and software**
- **Information about status of the development**
- **Demonstration Sample Datasets**

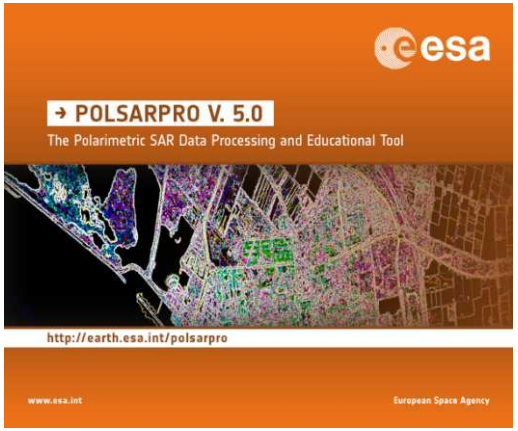
→ 3rd ADVANCED COURSE ON RADAR POLARIMETRY

PolSARpro v5.0

Practical – Part 1



Eric POTTIER

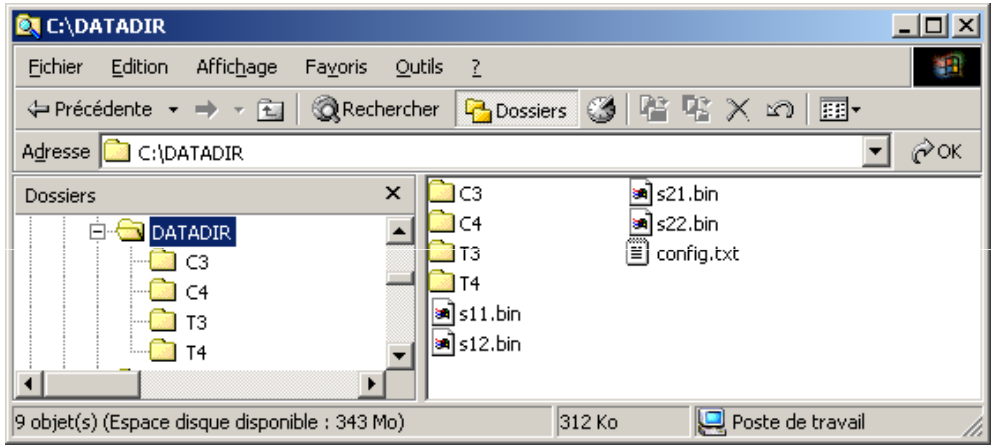


19–23 January 2015 | ESA-ESRIN | Frascati (Rome), Italy

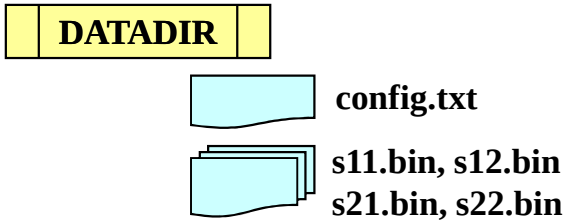
European Space Agency

General Presentation of PolSARpro v5.0 Software

Compatible Raw Binary Data



2x2 Complex Sinclair Matrix [S2]



PolarCase

- Monostatic s12.bin == s21.bin
- Bistatic s12.bin <> s21.bin
- Intensities Ixy.bin

PolarType

- Full s11.bin, s12.bin, s21.bin, s22.bin
- pp1 s11.bin, s21.bin
- pp2 s12.bin, s22.bin
- pp3 s11.bin, s22.bin
- pp4 I11.bin, I12.bin, I22.bin
- pp5 I11.bin, I21.bin
- pp6 I12.bin, I22.bin
- pp7 I11.bin, I22.bin

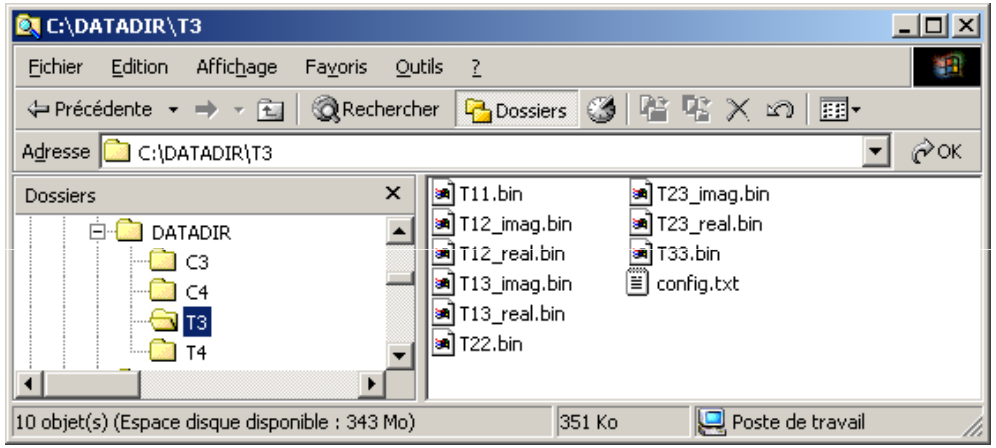
Nrow
1234

Ncol
4789

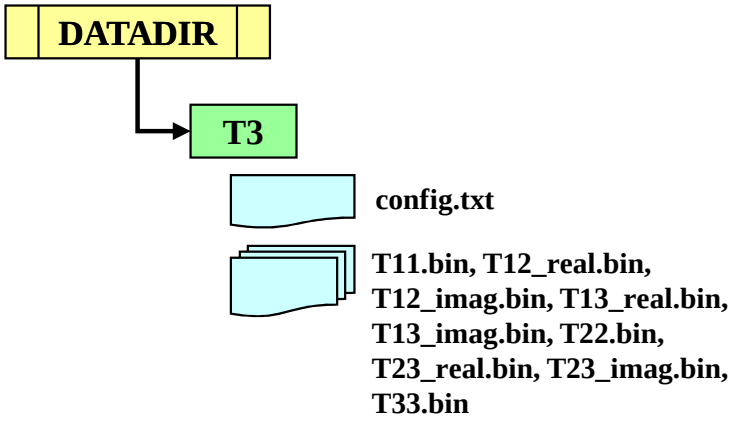
PolarCase
Monostatic/Bistatic/Intensities

PolarType
Full/pp1/pp2/pp3/pp4/pp5/pp6/pp7

Compatible Raw Binary Data



3x3 Complex Coherency Matrix [T3]



$$\underline{k}_{3P} = \frac{1}{\sqrt{2}} \left[\; S_{11} + S_{22} \quad S_{11} - S_{22} \quad S_{12} + S_{21} \; \right]$$

$$\Longrightarrow \qquad [T_3] = \langle \underline{k}_{3P} . \underline{k}_{3P}^{\dagger} \rangle$$

$$[T_3] = \begin{bmatrix} T_{11} & T_{12} & T_{13} \\ T_{12}^{*} & T_{22} & T_{23} \\ T_{13}^{*} & T_{23}^{*} & T_{33} \end{bmatrix}$$

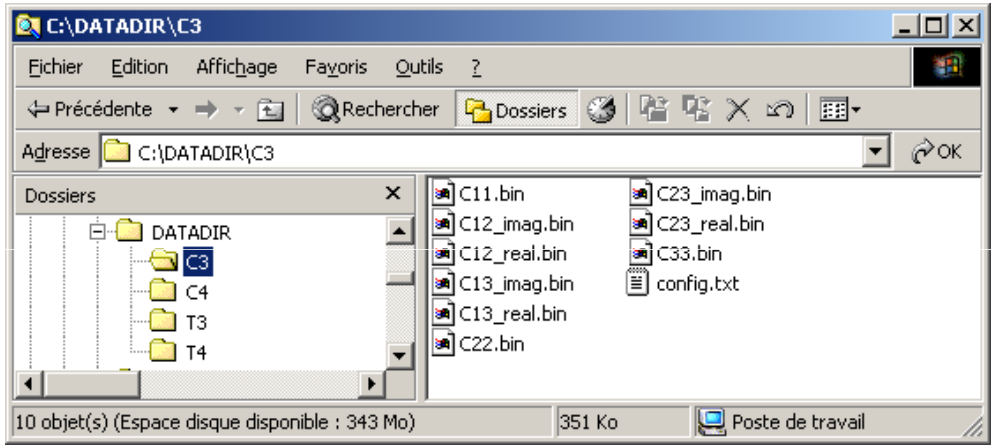
Nrow
1234

Ncol
4789

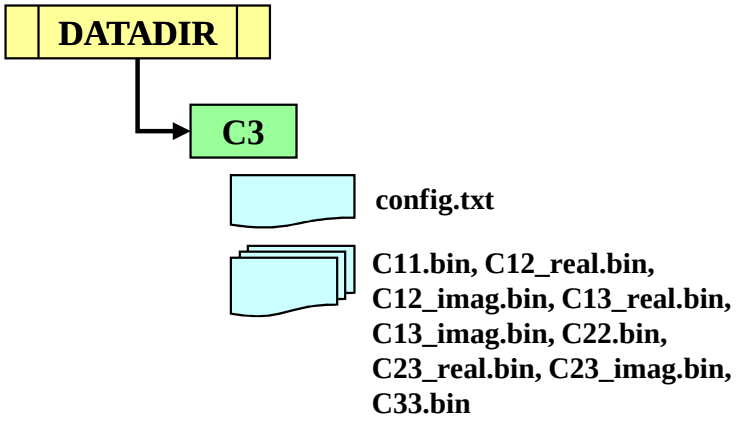
PolarCase
Monostatic/Bistatic

PolarType
Full

Compatible Raw Binary Data



3x3 Complex Covariance Matrix [C3]



$$\underline{k}_{3L} = \begin{bmatrix} S_{11} & S_{12}.\sqrt{2} & S_{22} \end{bmatrix}$$

$$\Longrightarrow \quad [C_3] = \langle \underline{k}_{3L}.\underline{k}_{3L}^{\dagger} \rangle$$

$$[C_3] = \begin{bmatrix} C_{11} & C_{12} & C_{13} \\ C_{12}^{*} & C_{22} & C_{23} \\ C_{13}^{*} & C_{23}^{*} & C_{33} \end{bmatrix}$$

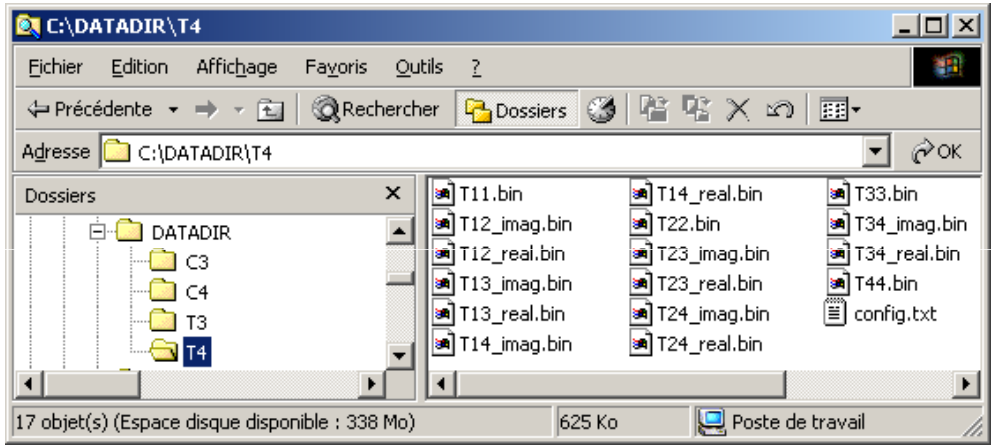
Nrow
1234

Ncol
4789

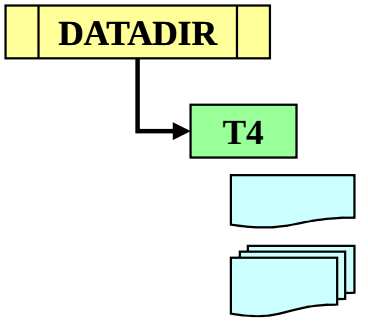
PolarCase
Monostatic/Bistatic

PolarType
Full

Compatible Raw Binary Data



4x4 Complex Coherency Matrix [T4]



$$\underline{k}_{4P} = \frac{1}{\sqrt{2}} \left[\; S_{11} + S_{22} \quad S_{11} - S_{22} \quad S_{12} + S_{21} \quad j(S_{12} - S_{21}) \; \right]$$

$$\Longrightarrow \quad [T_4] = \langle \underline{k}_{4P} . \underline{k}_{4P}^{\dagger} \rangle$$

$$[T_4] = \begin{bmatrix} T_{11} & T_{12} & T_{13} & T_{14} \\ T_{12}^{*} & T_{22} & T_{23} & T_{24} \\ T_{13}^{*} & T_{23}^{*} & T_{33} & T_{34} \\ T_{14}^{*} & T_{24}^{*} & T_{34}^{*} & T_{44} \end{bmatrix}$$

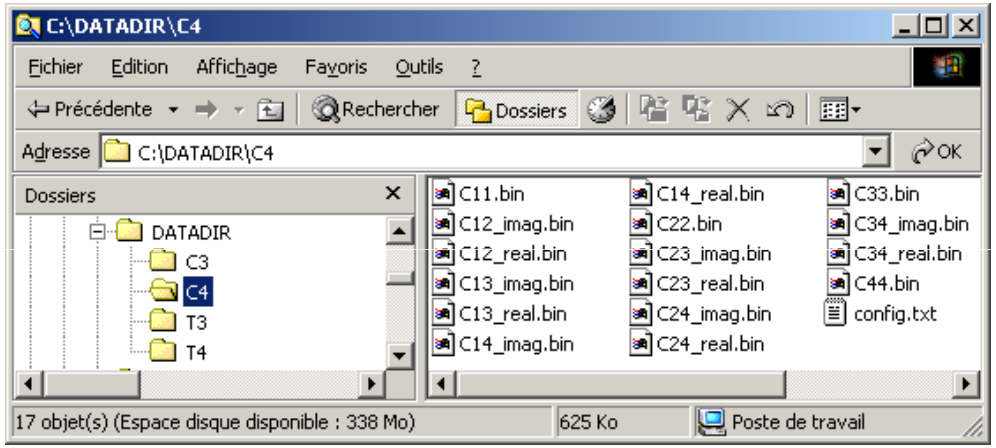
Nrow
1234

Ncol
4789

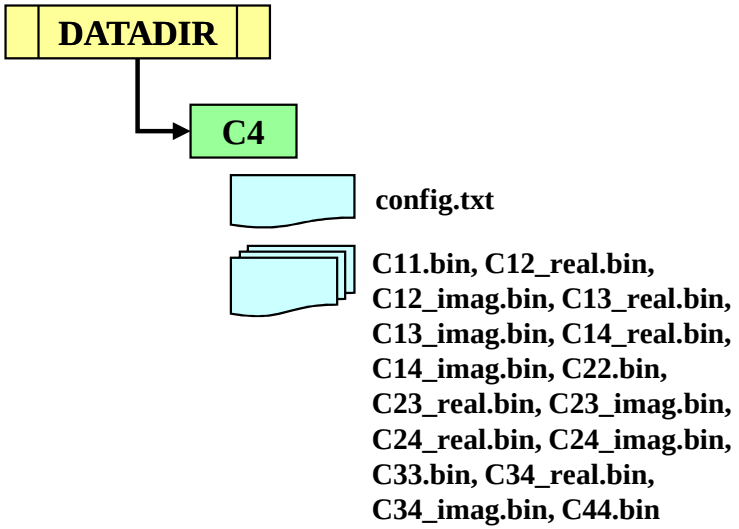
PolarCase
Bistatic

PolarType
Full

Compatible Raw Binary Data



4x4 Complex Covariance Matrix [C4]



$$\underline{k}_{4L} = \begin{bmatrix} S_{11} & S_{12} & S_{21} & S_{22} \end{bmatrix}$$

$$\Longrightarrow \qquad [C_4] = \langle \underline{k}_{4L} . \underline{k}_{4L}^{\dagger} \rangle$$

$$[C_4] = \begin{bmatrix} C_{11} & C_{12} & C_{13} & C_{14} \\ C_{12}^{*} & C_{22} & C_{23} & C_{24} \\ C_{13}^{*} & C_{23}^{*} & C_{33} & C_{34} \\ C_{14}^{*} & C_{24}^{*} & C_{34}^{*} & C_{44} \end{bmatrix}$$

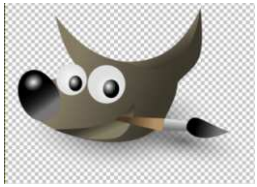
Nrow
1234

Ncol
4789

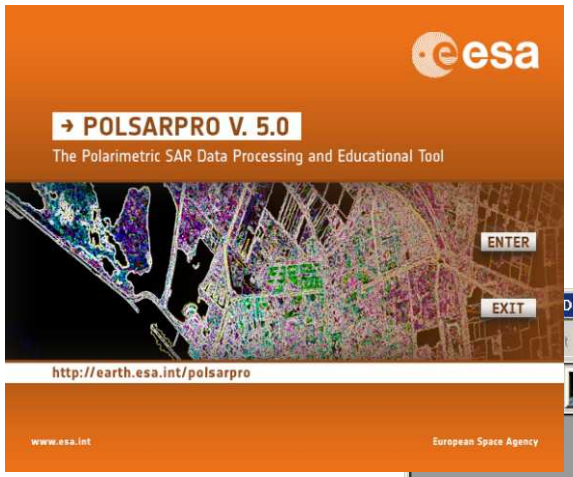
PolarCase
Bistatic

PolarType
Full

CONFIGURATION

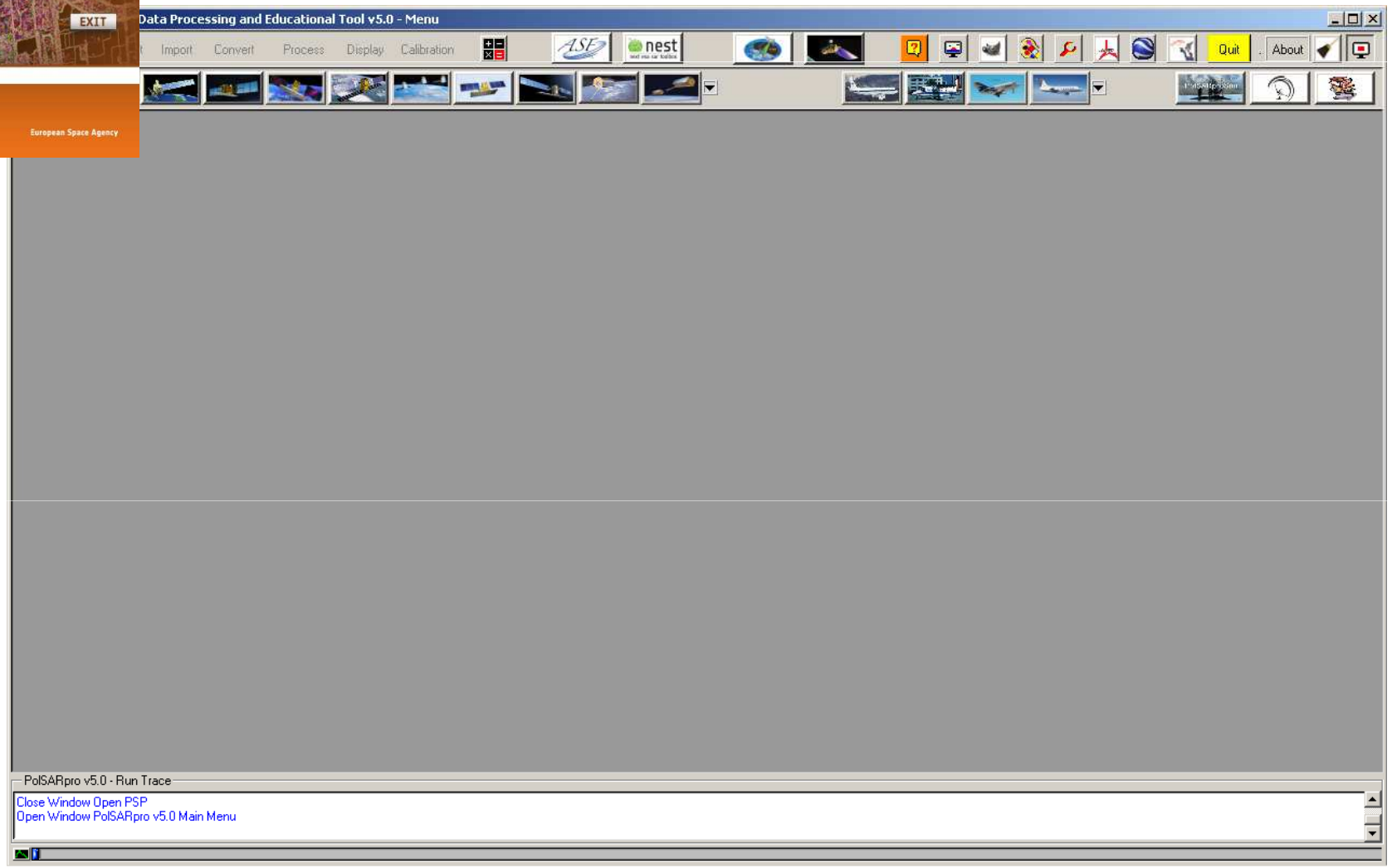


Google Earth

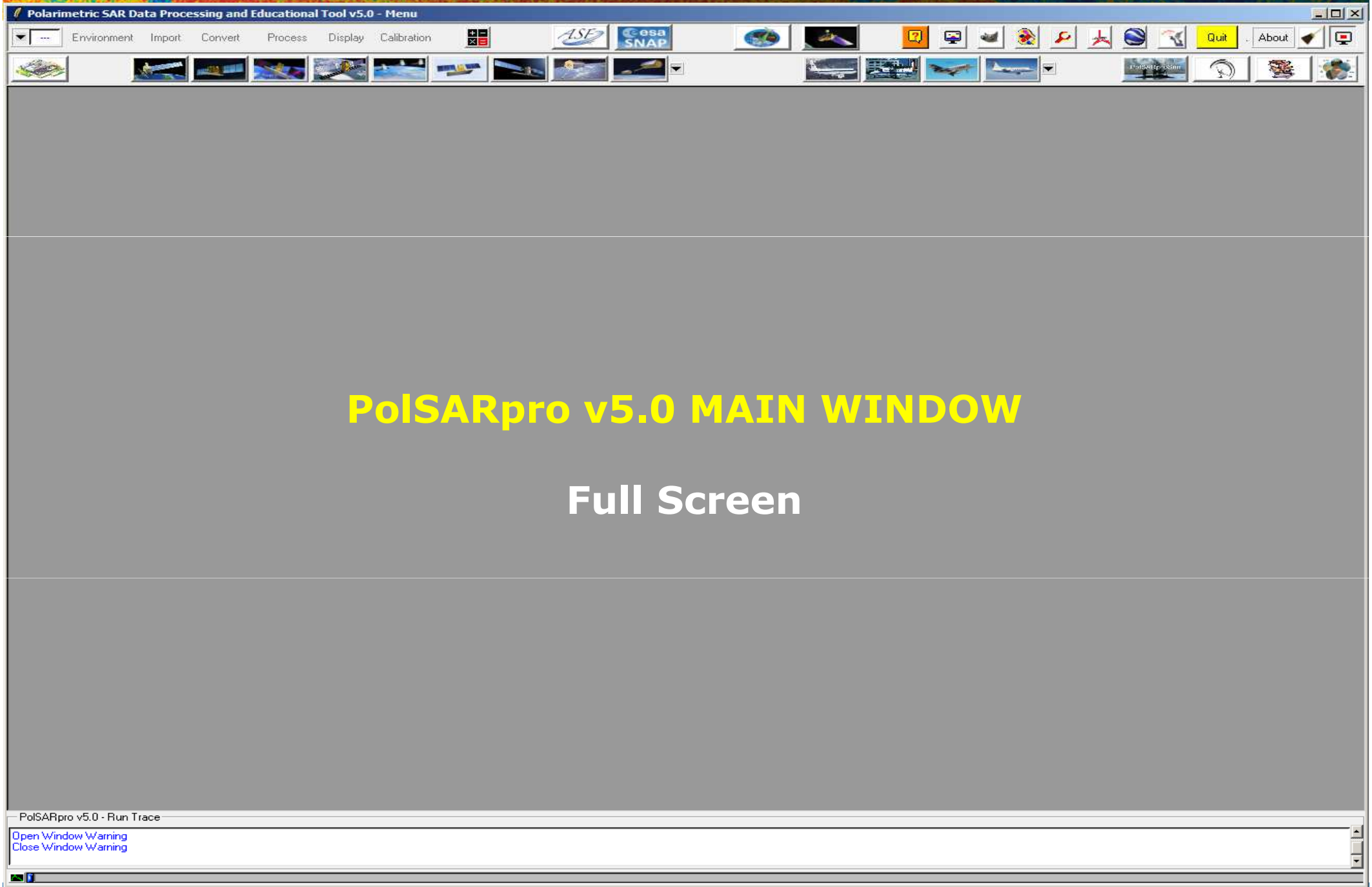


ENTRY SCREEN

MAIN WINDOW



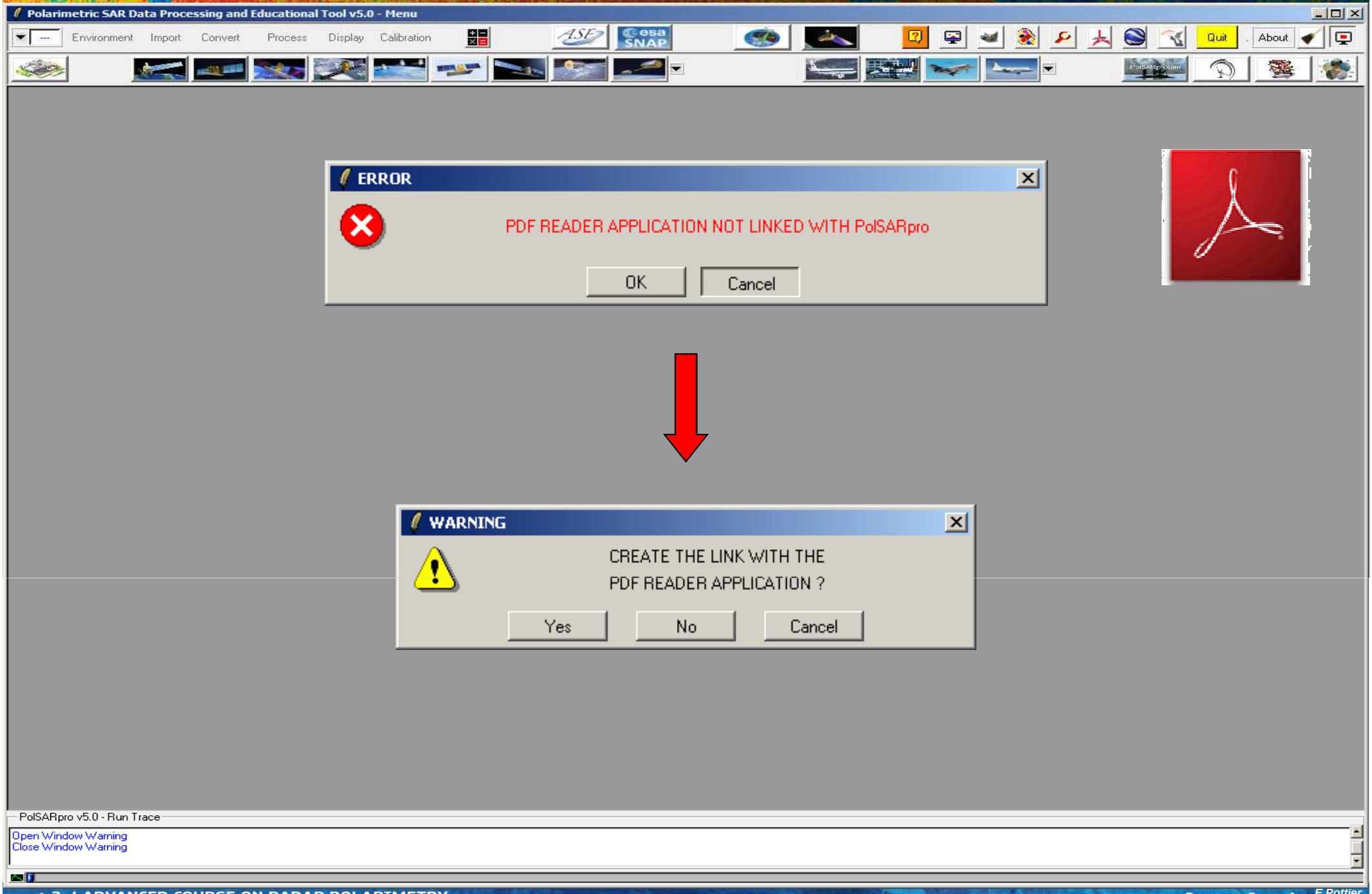
PolSARpro v5.0 SOFTWARE



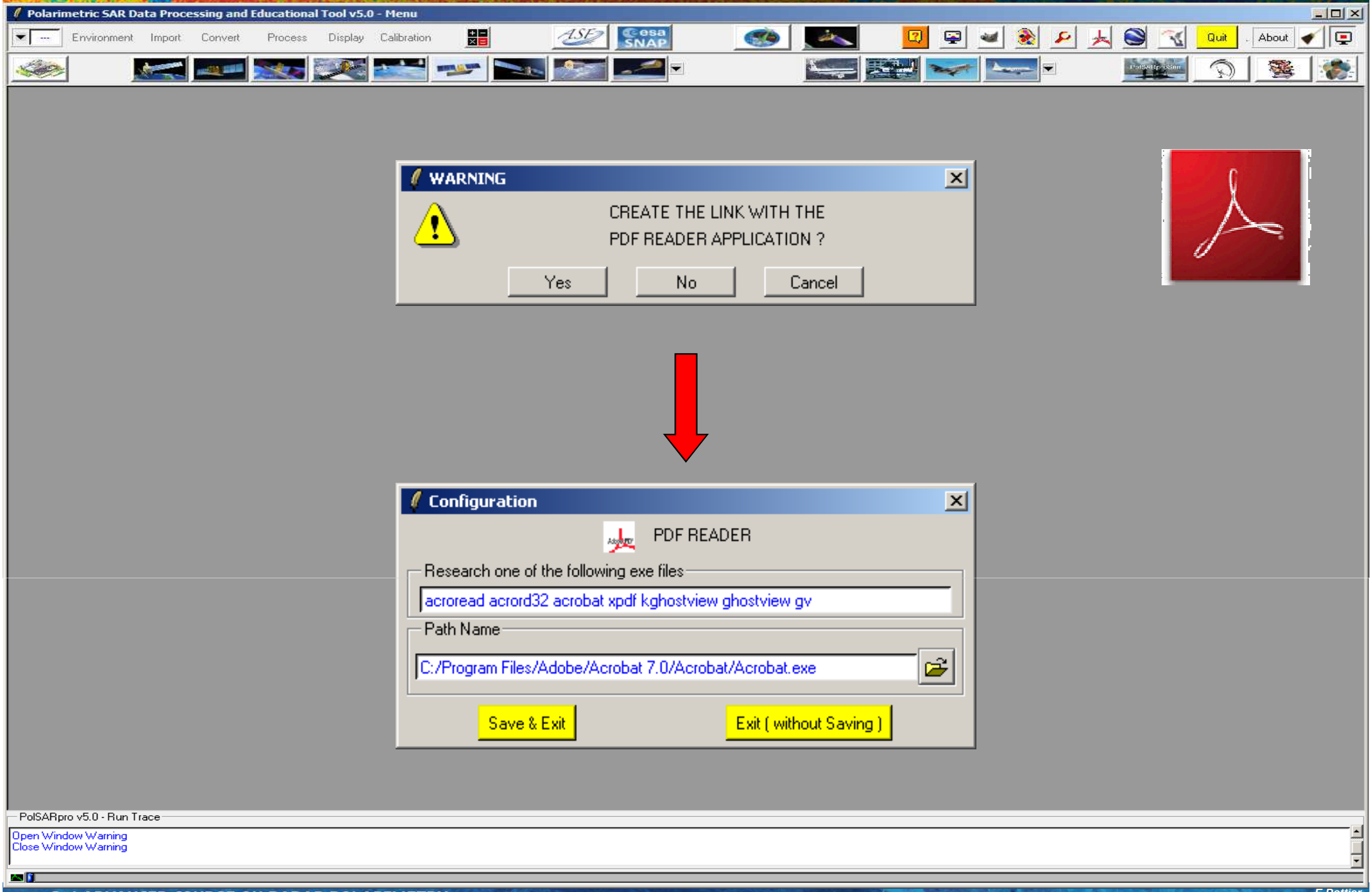
PolSARpro v5.0 MAIN WINDOW

Full Screen

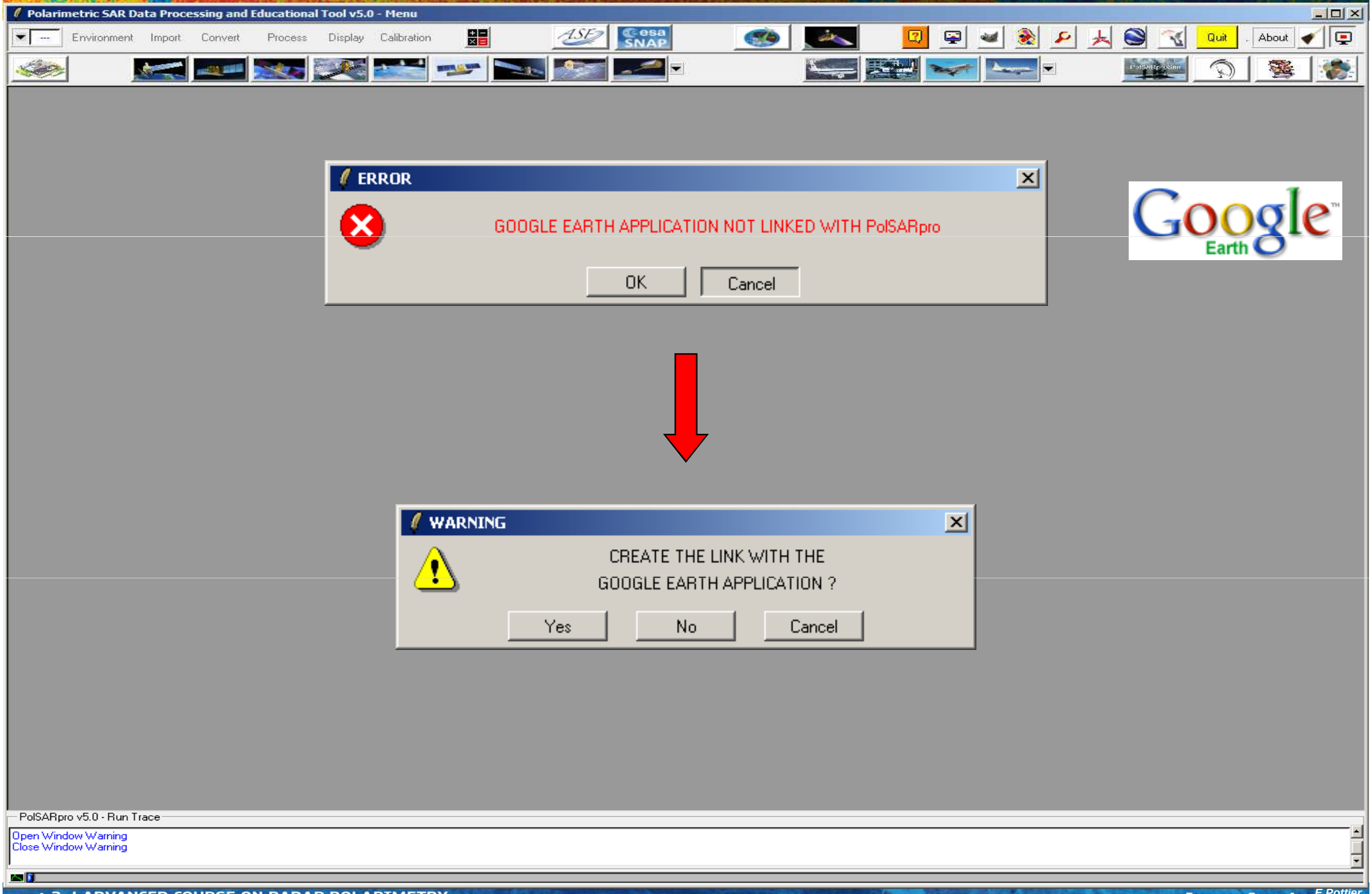
PolSARpro v5.0 SOFTWARE



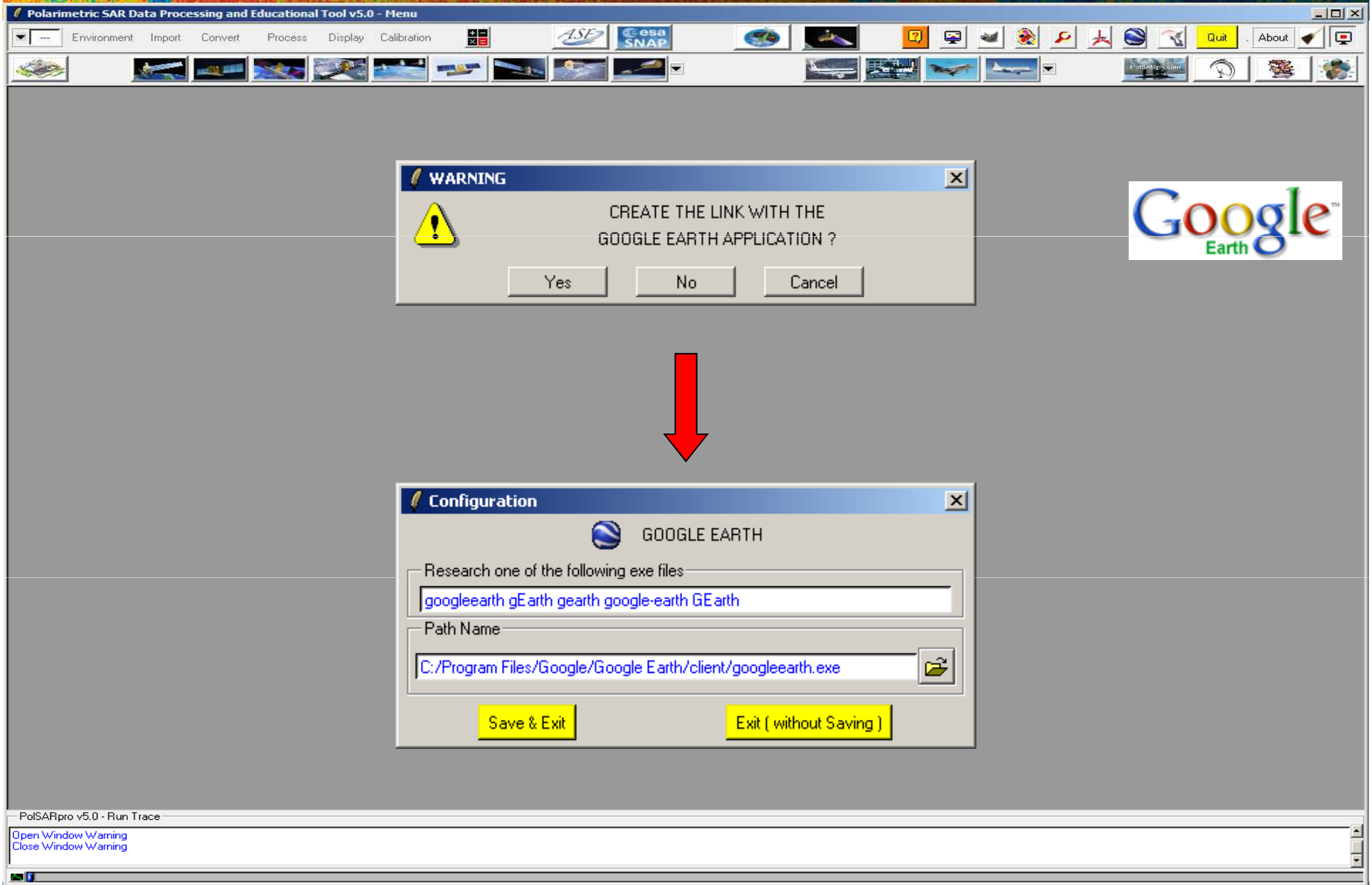
PolSARpro v5.0 SOFTWARE

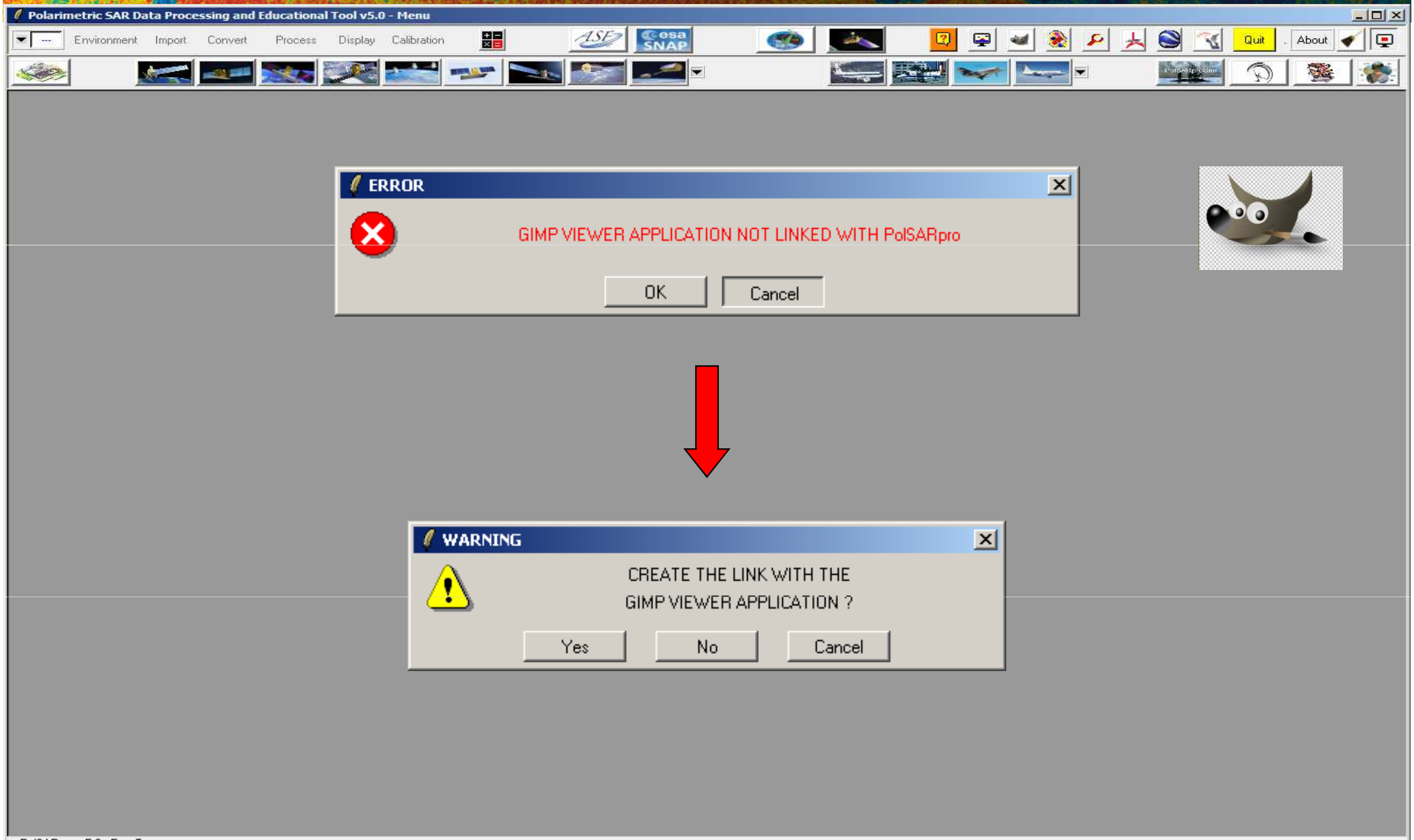


PolSARpro v5.0 SOFTWARE

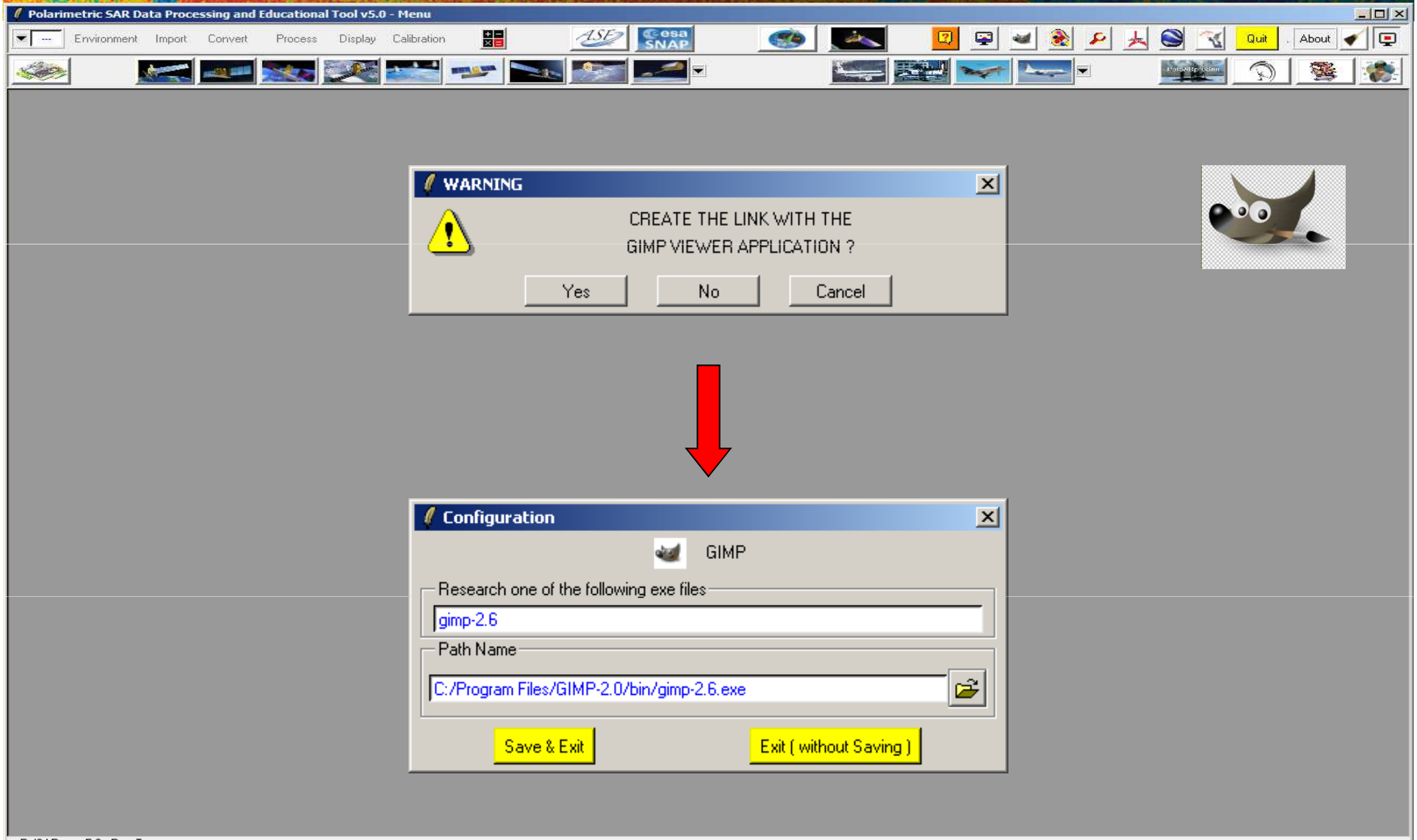


PolSARpro v5.0 SOFTWARE

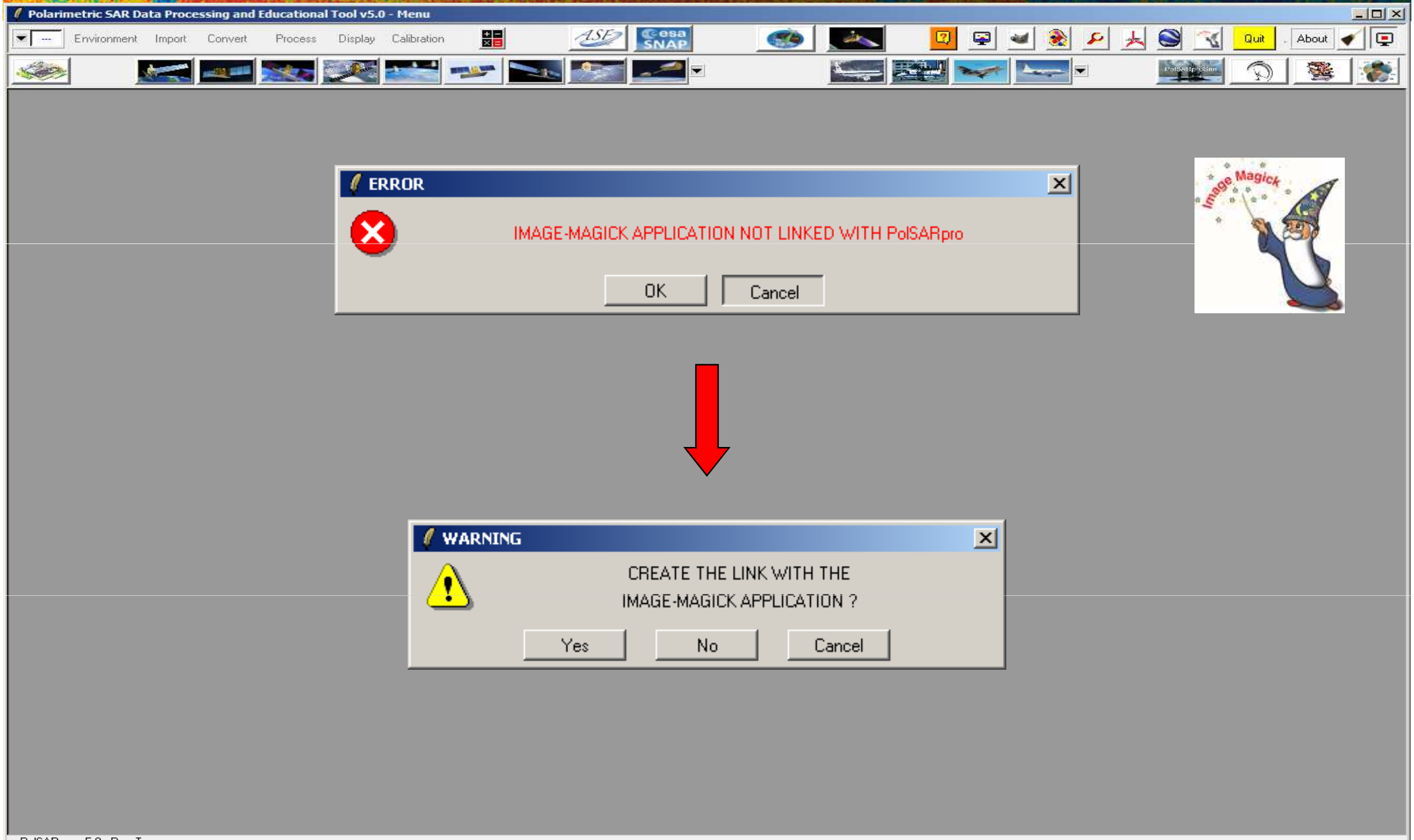



Polarimetric SAR Data Processing and Educational Tool v5.0 - Menu
Environment
Import
Convert
Process
Display
Calibration
Quit
About
ERROR
GIMP VIEWER APPLICATION NOT LINKED WITH PolSARpro
OK
Cancel
WARNING
CREATE THE LINK WITH THE
GIMP VIEWER APPLICATION ?
Yes
No
Cancel
PolSARpro v5.0 - Run Trace
Open Window Warning
Close Window Warning

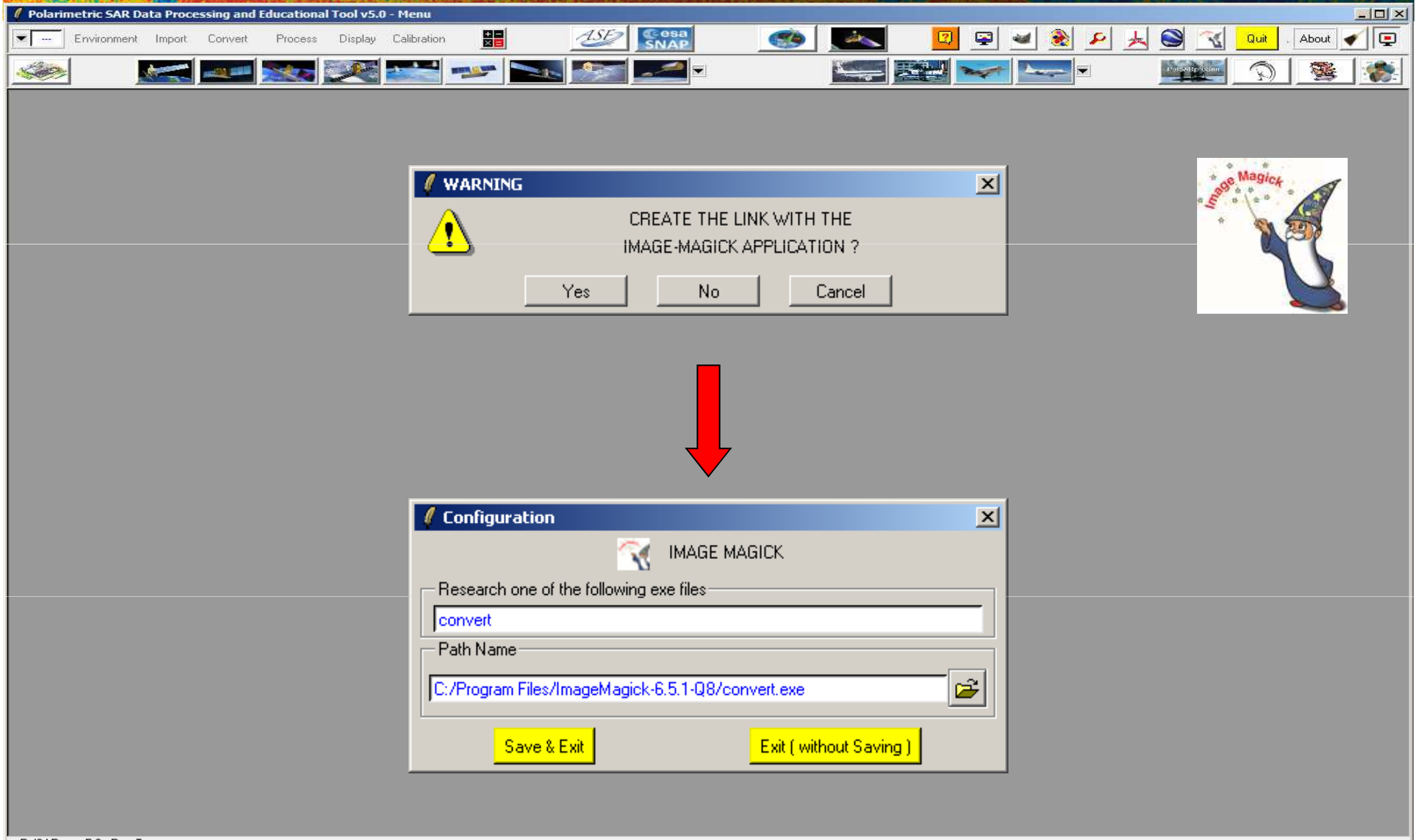
PolSARpro v5.0 SOFTWARE



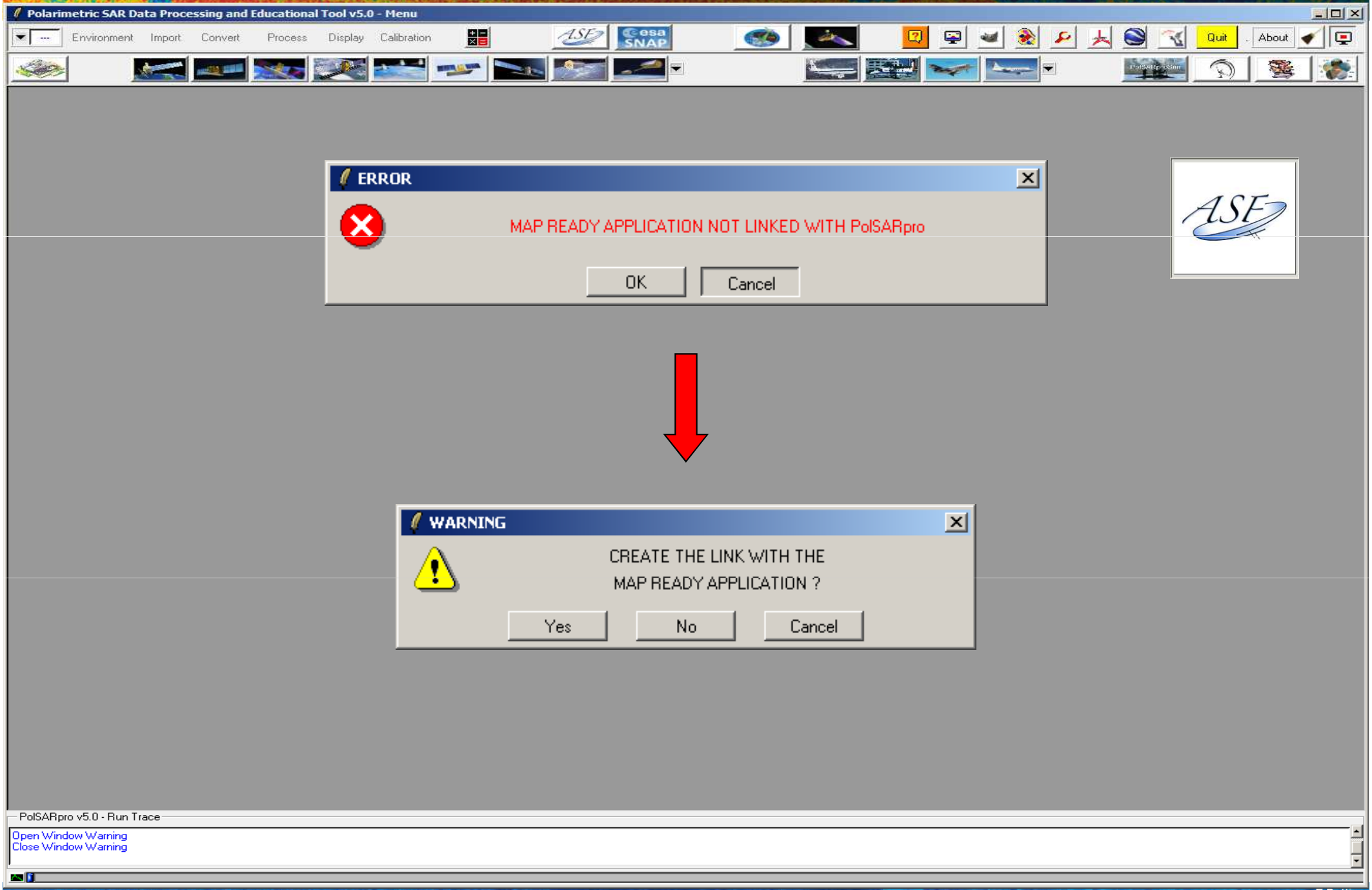
PolSARpro v5.0 SOFTWARE



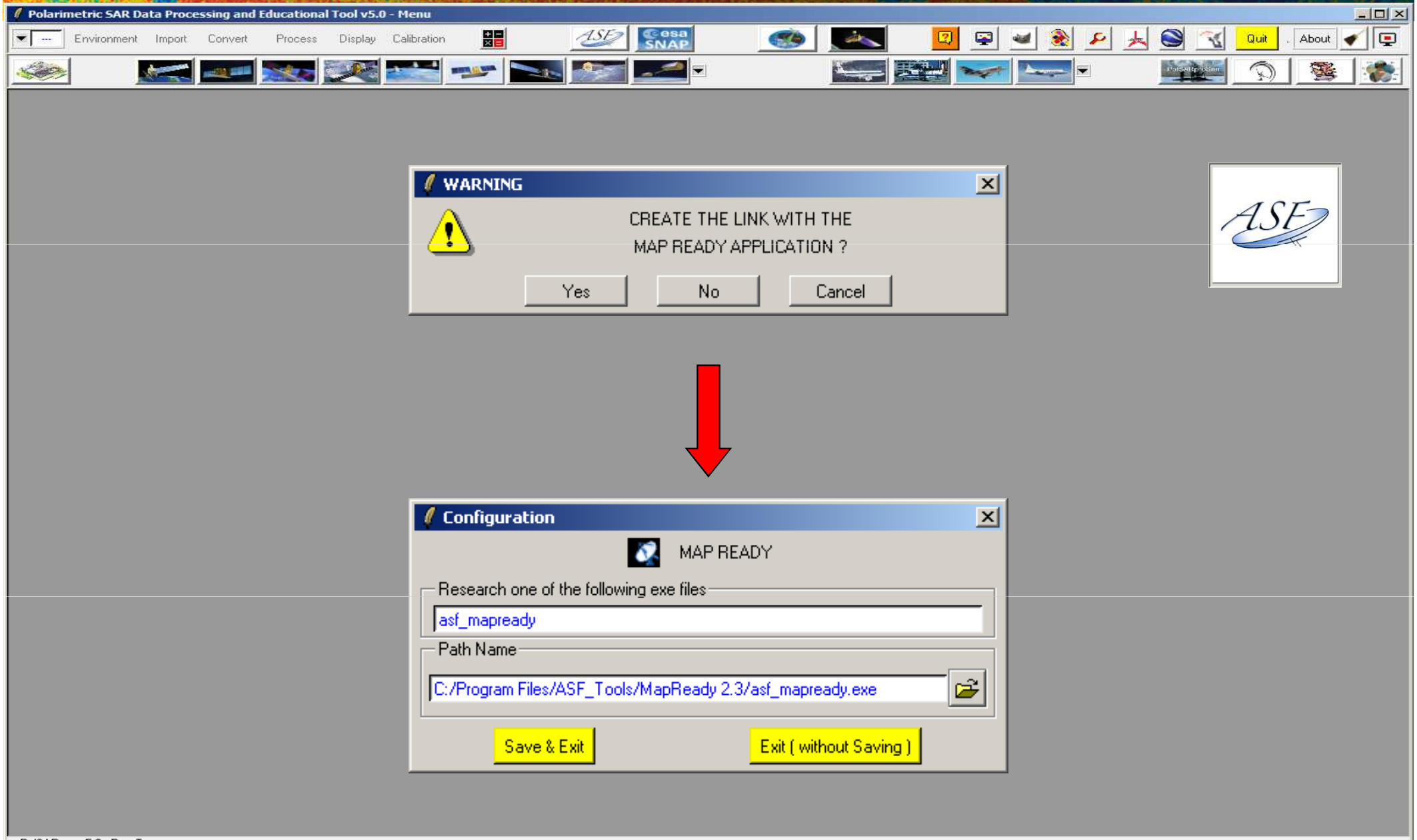
PolSARpro v5.0 SOFTWARE



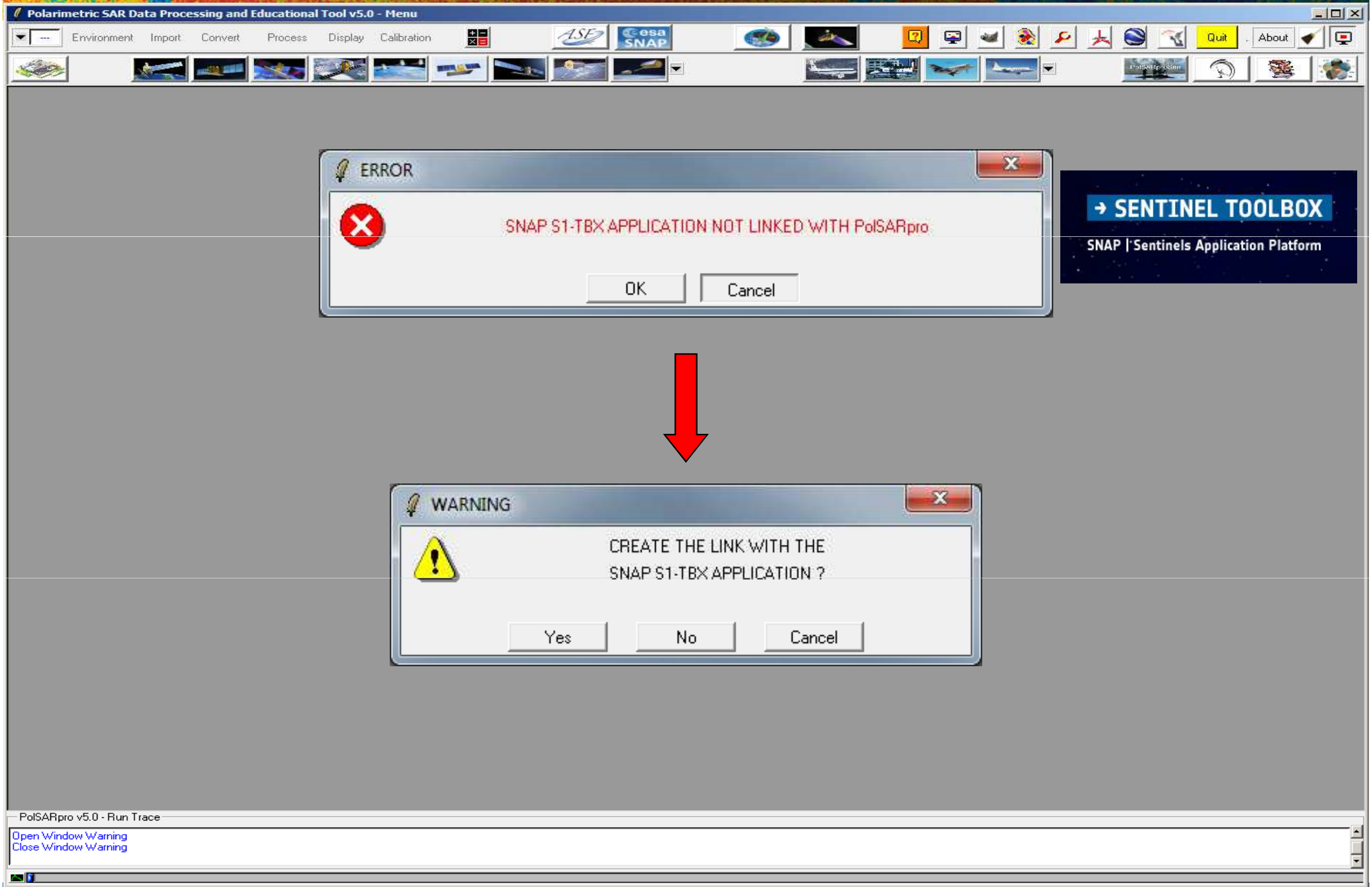
PolSARpro v5.0 SOFTWARE



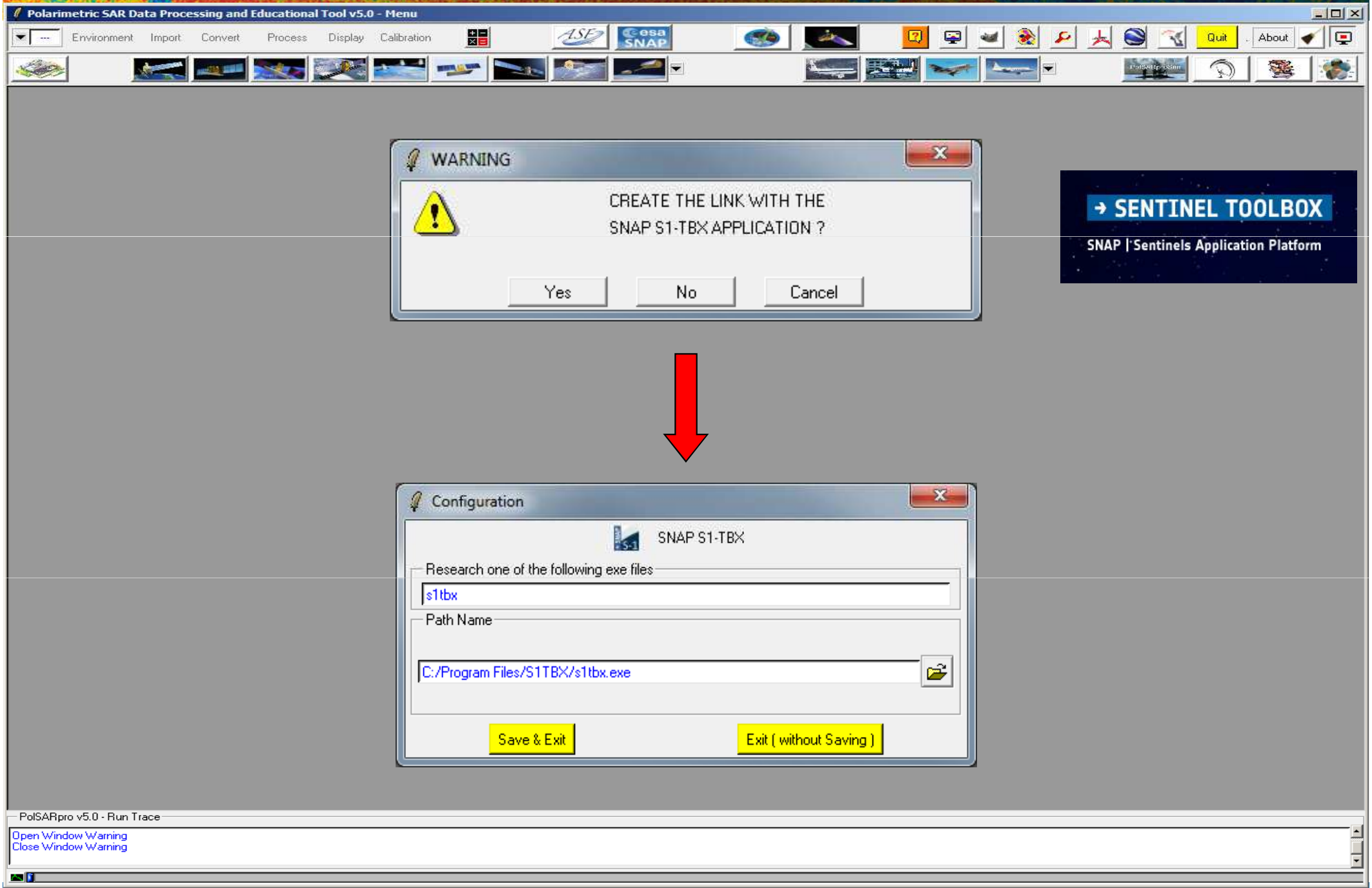
PolSARpro v5.0 SOFTWARE



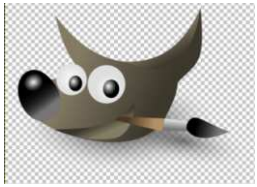
PolSARpro v5.0 SOFTWARE



PolSARpro v5.0 SOFTWARE

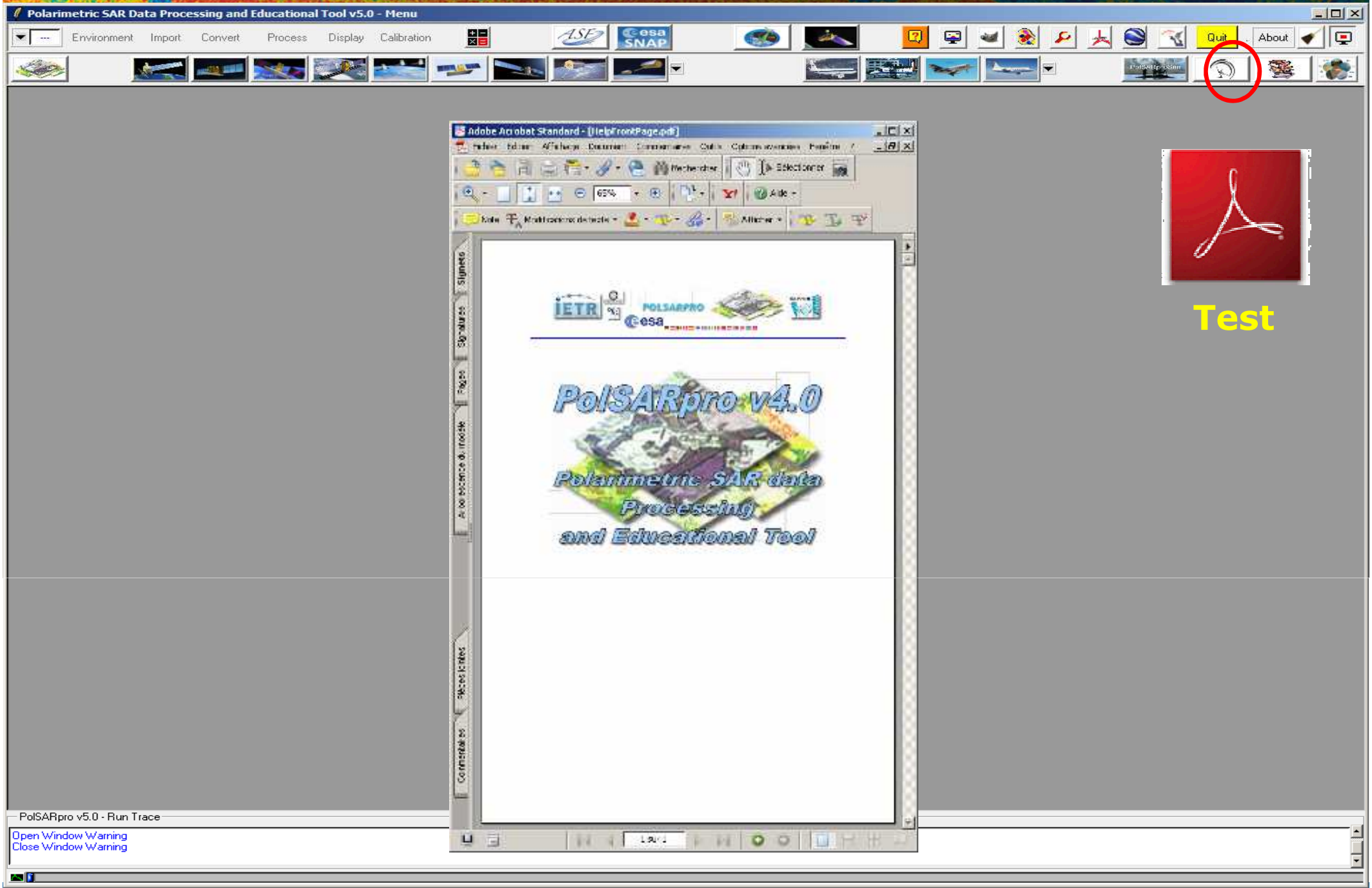


TEST THE CONFIGURATION



Google Earth

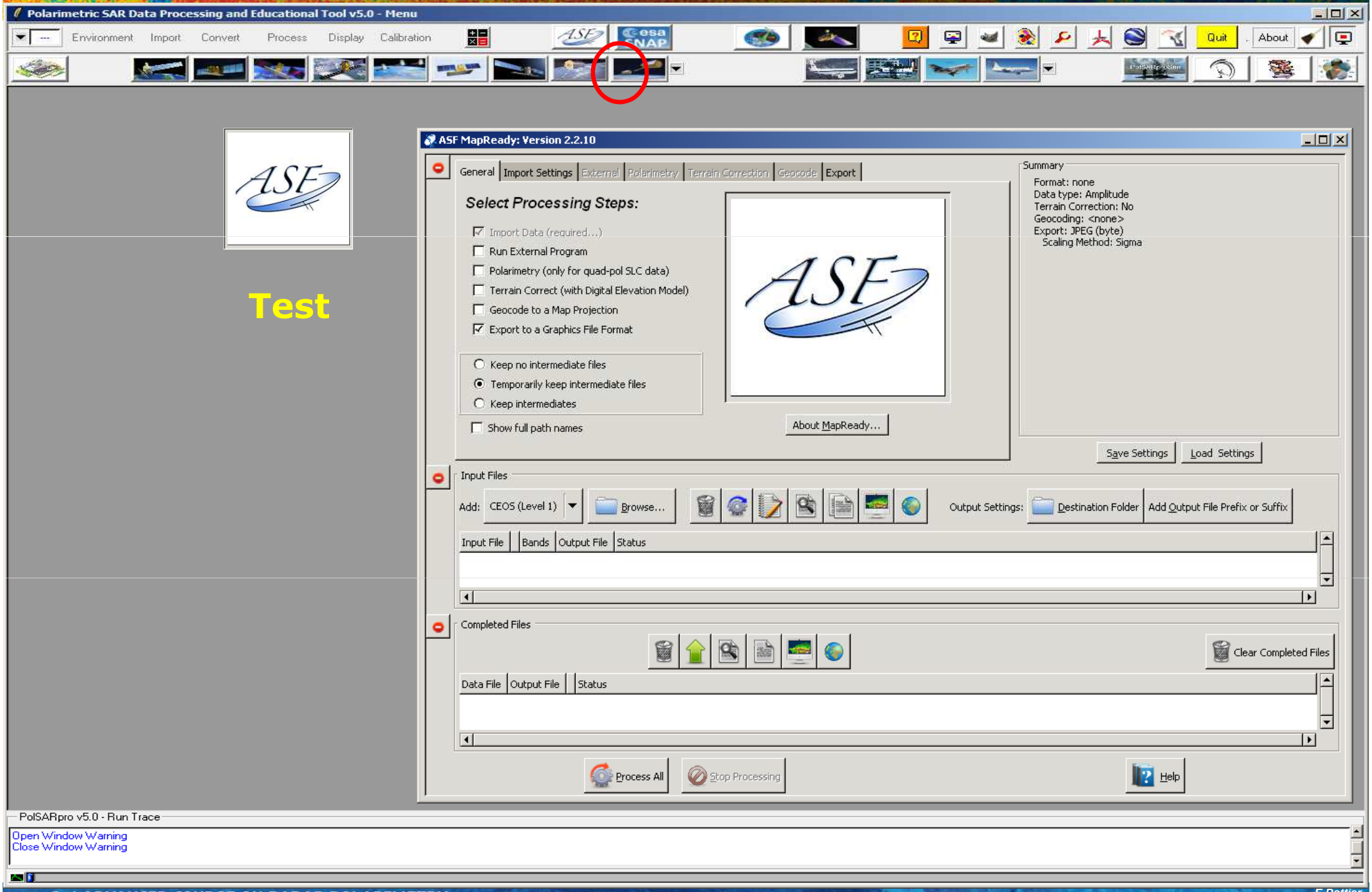
PolSARpro v5.0 SOFTWARE



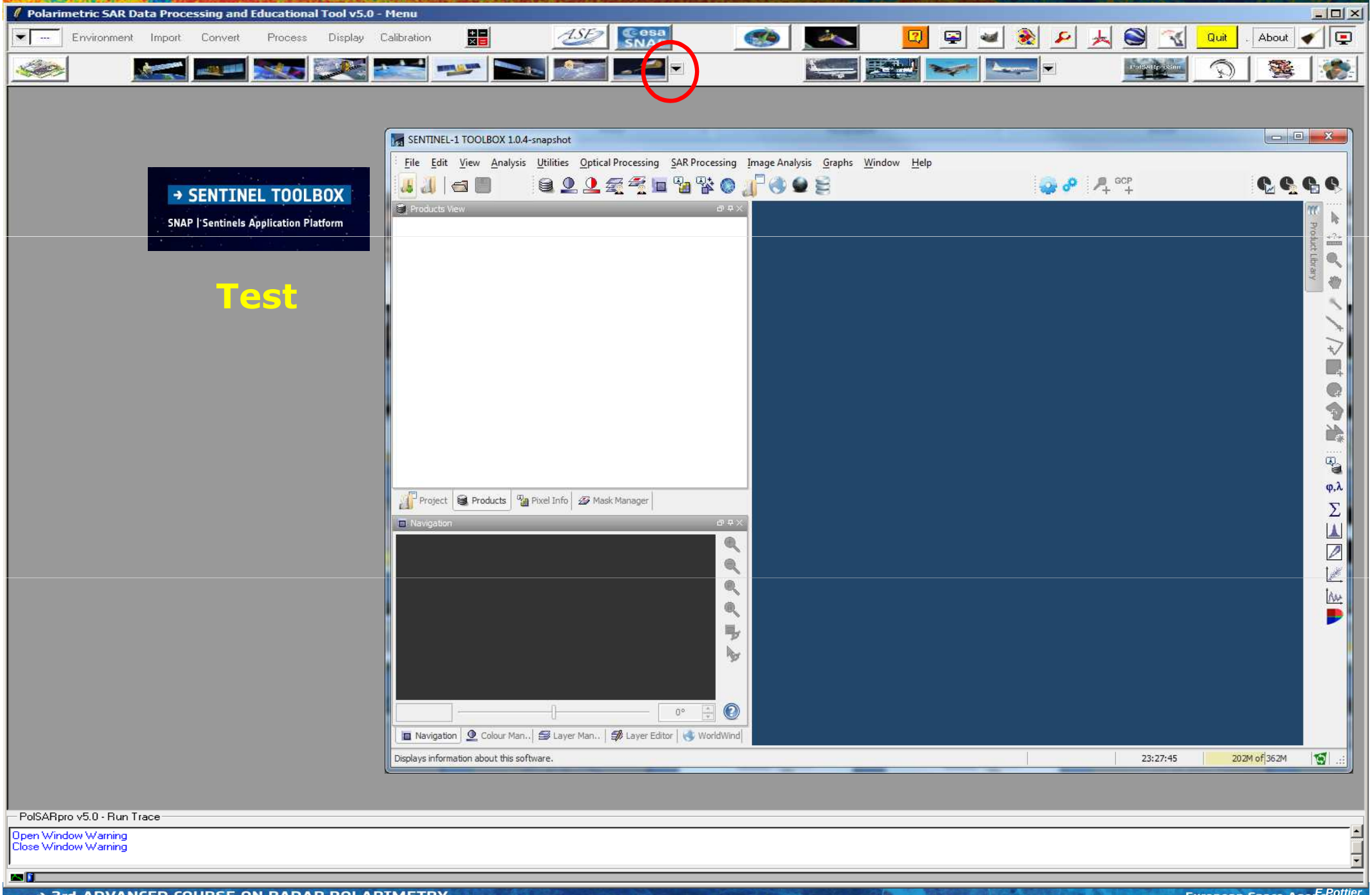
Test

PolSARpro v5.0 SOFTWARE

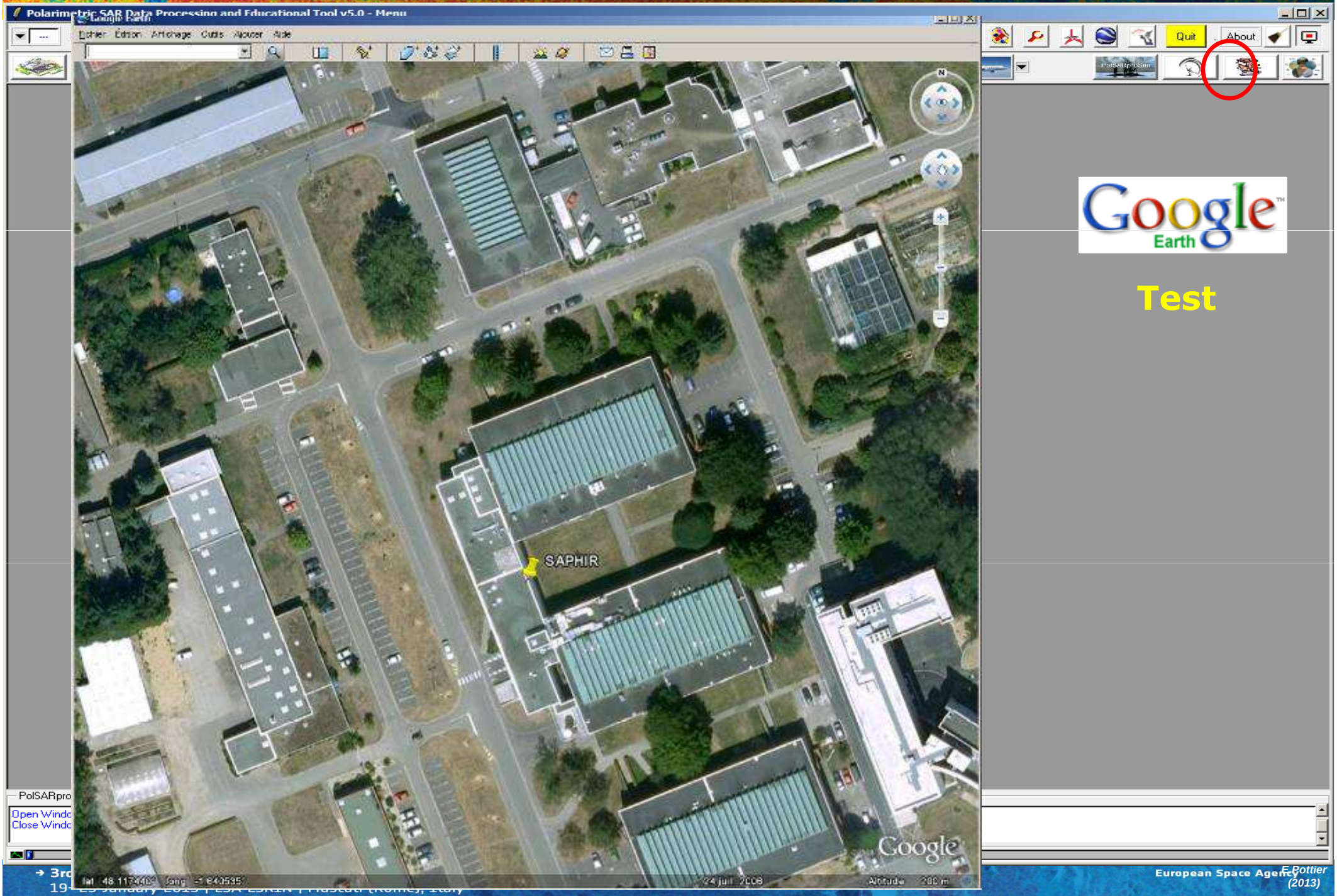
PolSARpro v5.0 SOFTWARE



PolSARpro v5.0 SOFTWARE

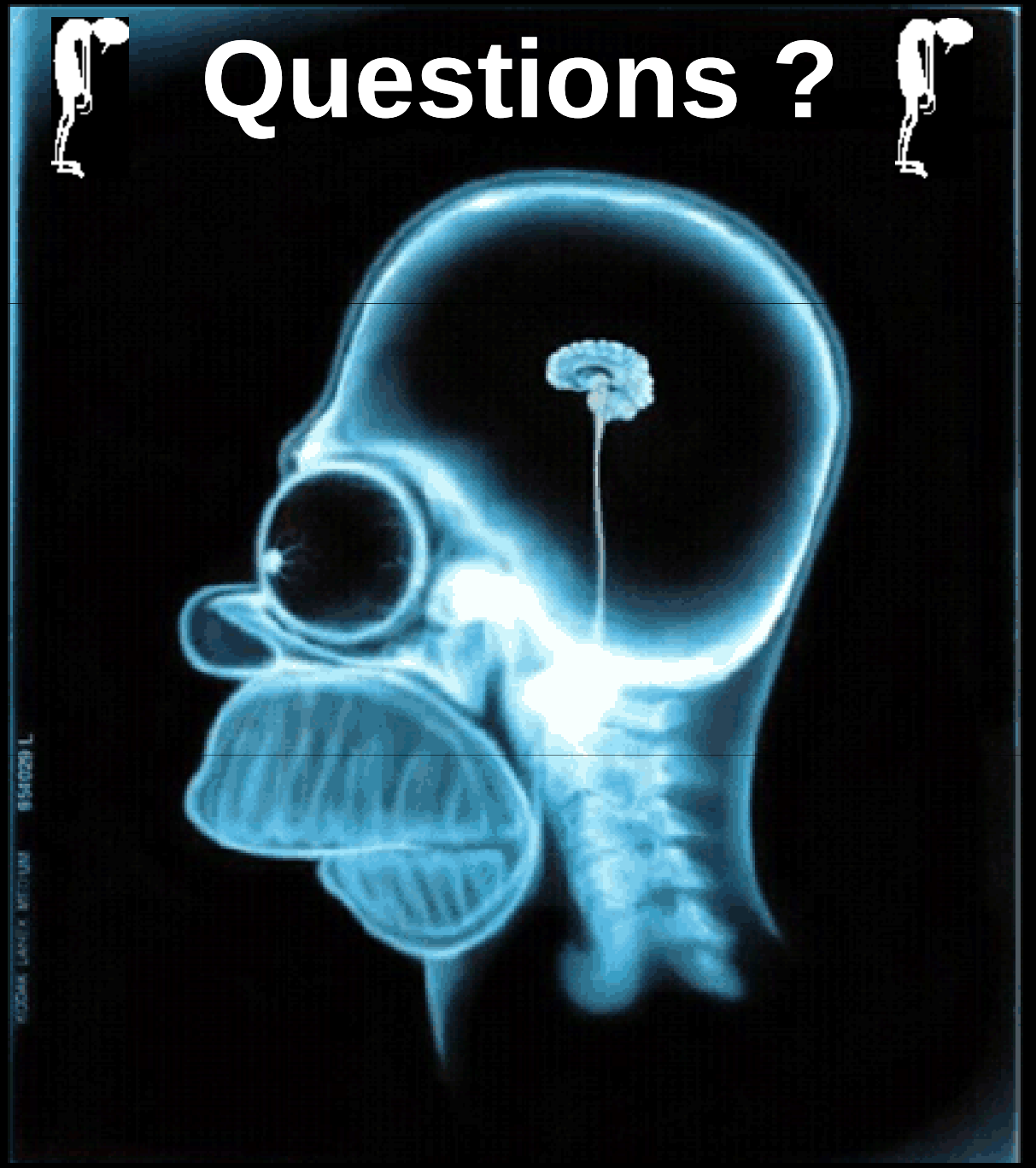


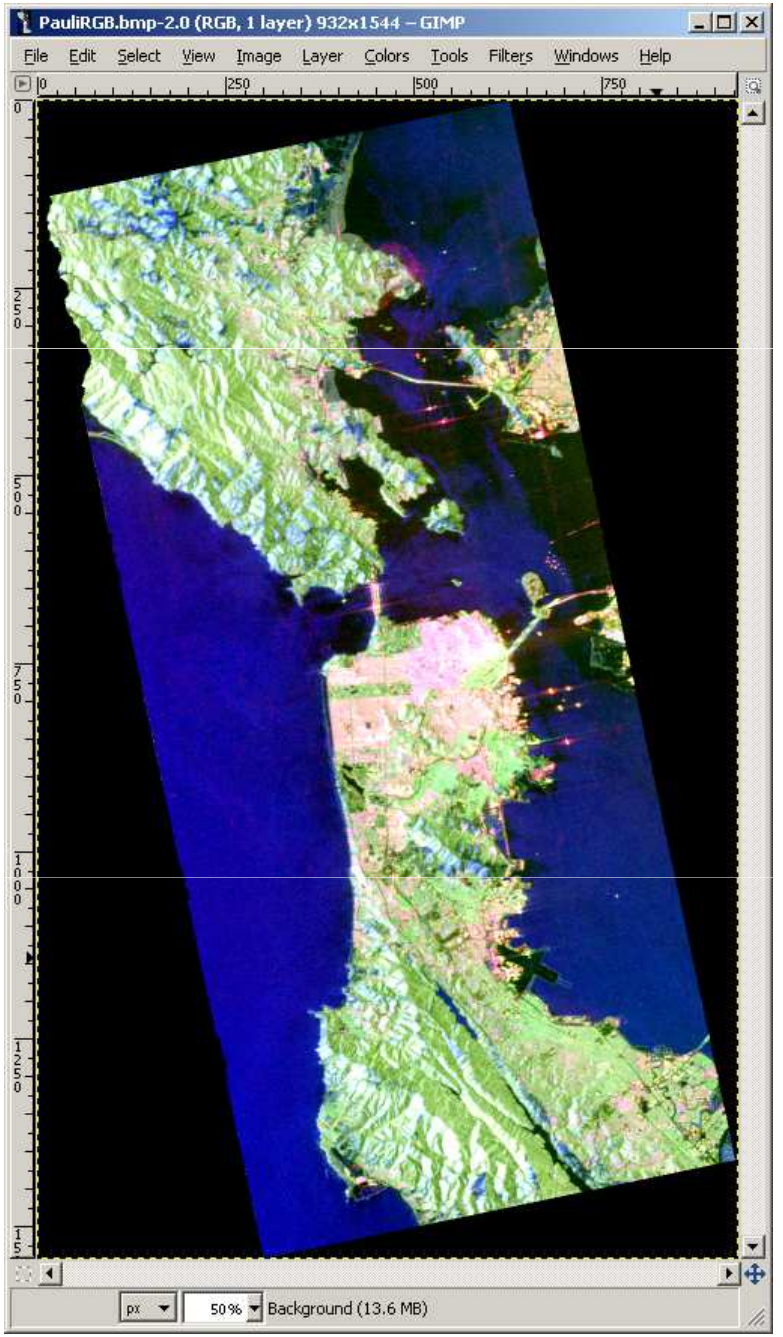
PolSARpro v5.0 SOFTWARE



E Pottier (2013)

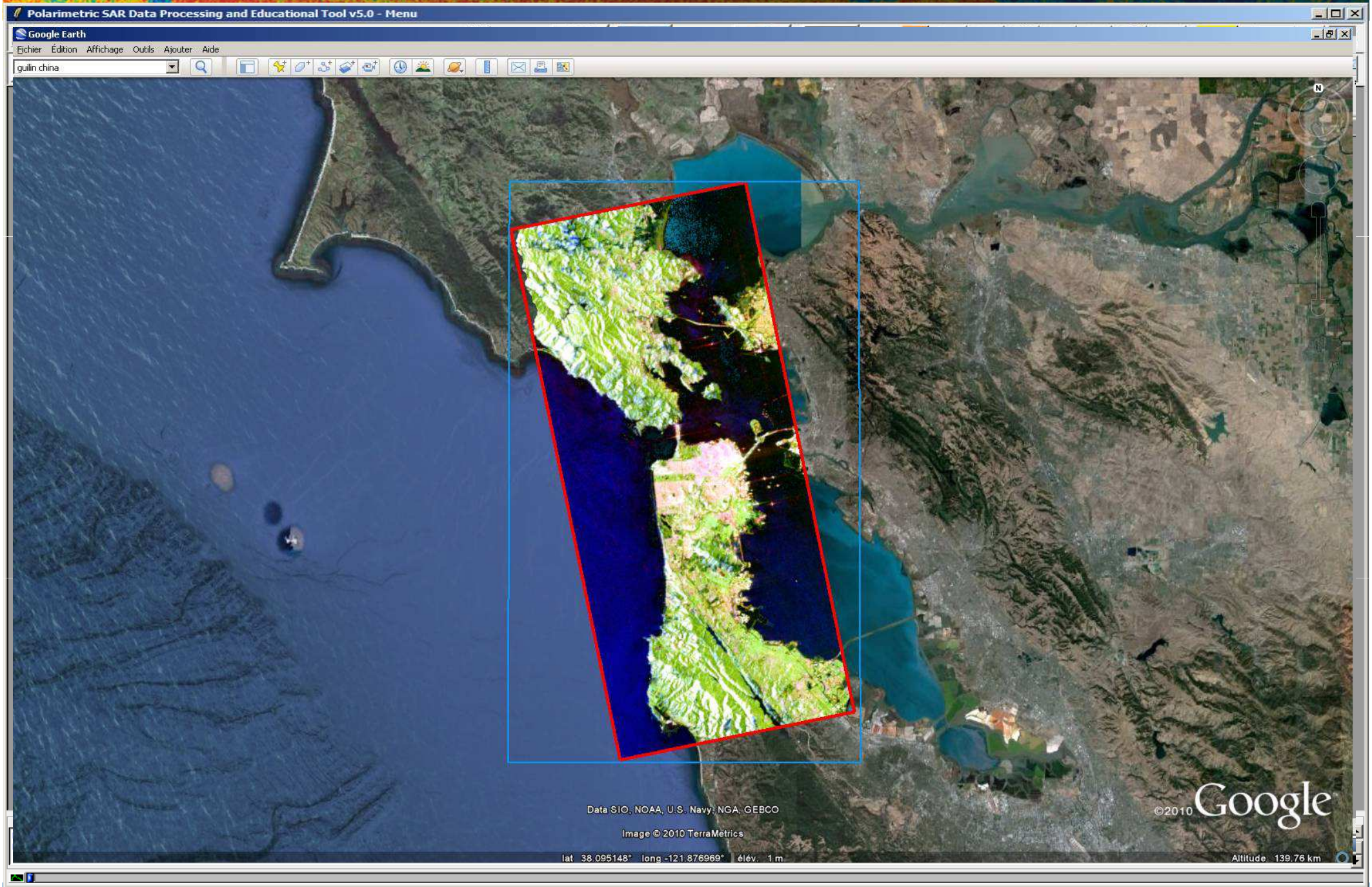
Questions ?



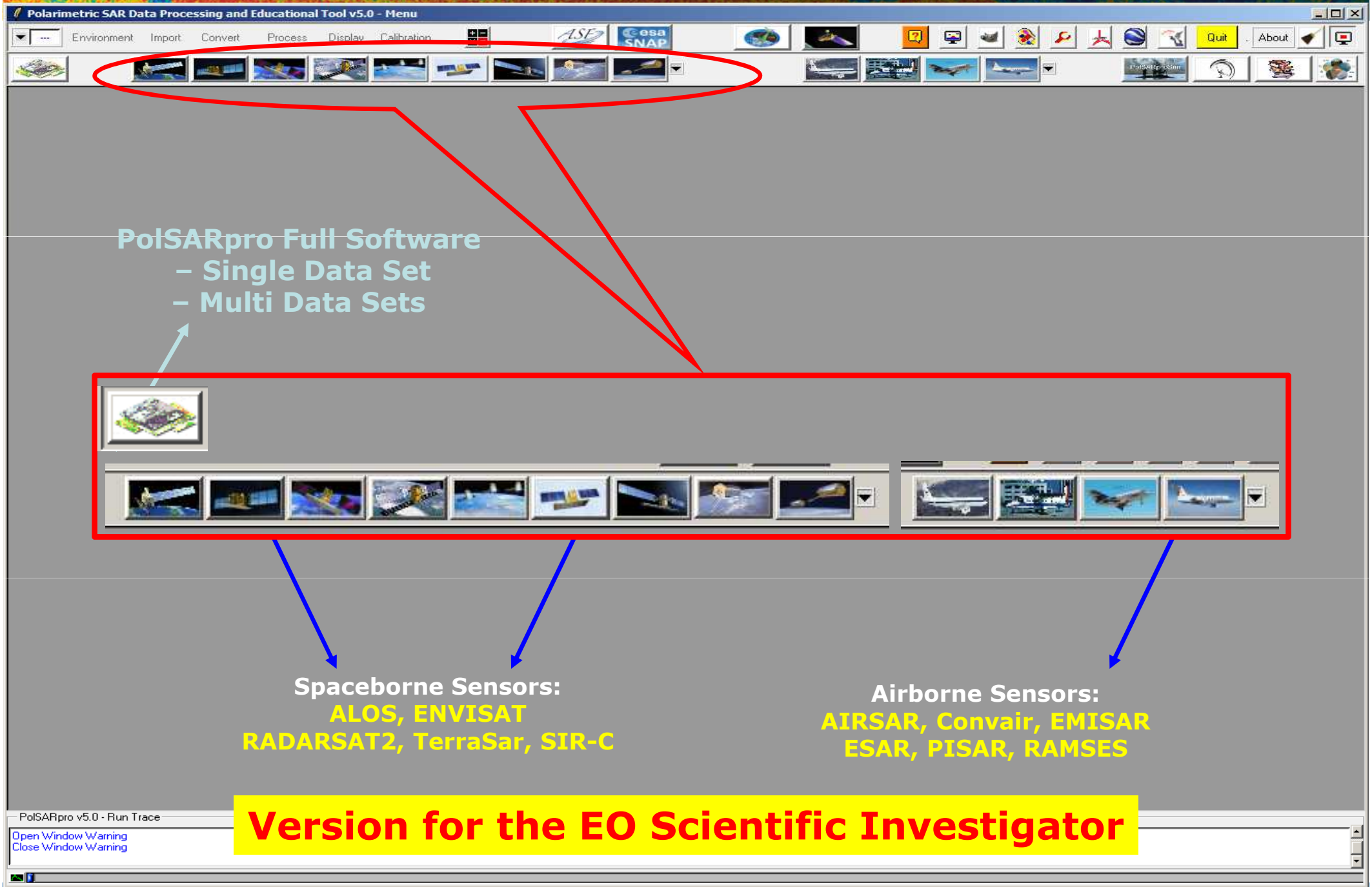


ALOS : Advanced Land Observing Satellite
PALSAR : Phase Array L-Band SAR

PolSARpro v5.0 SOFTWARE



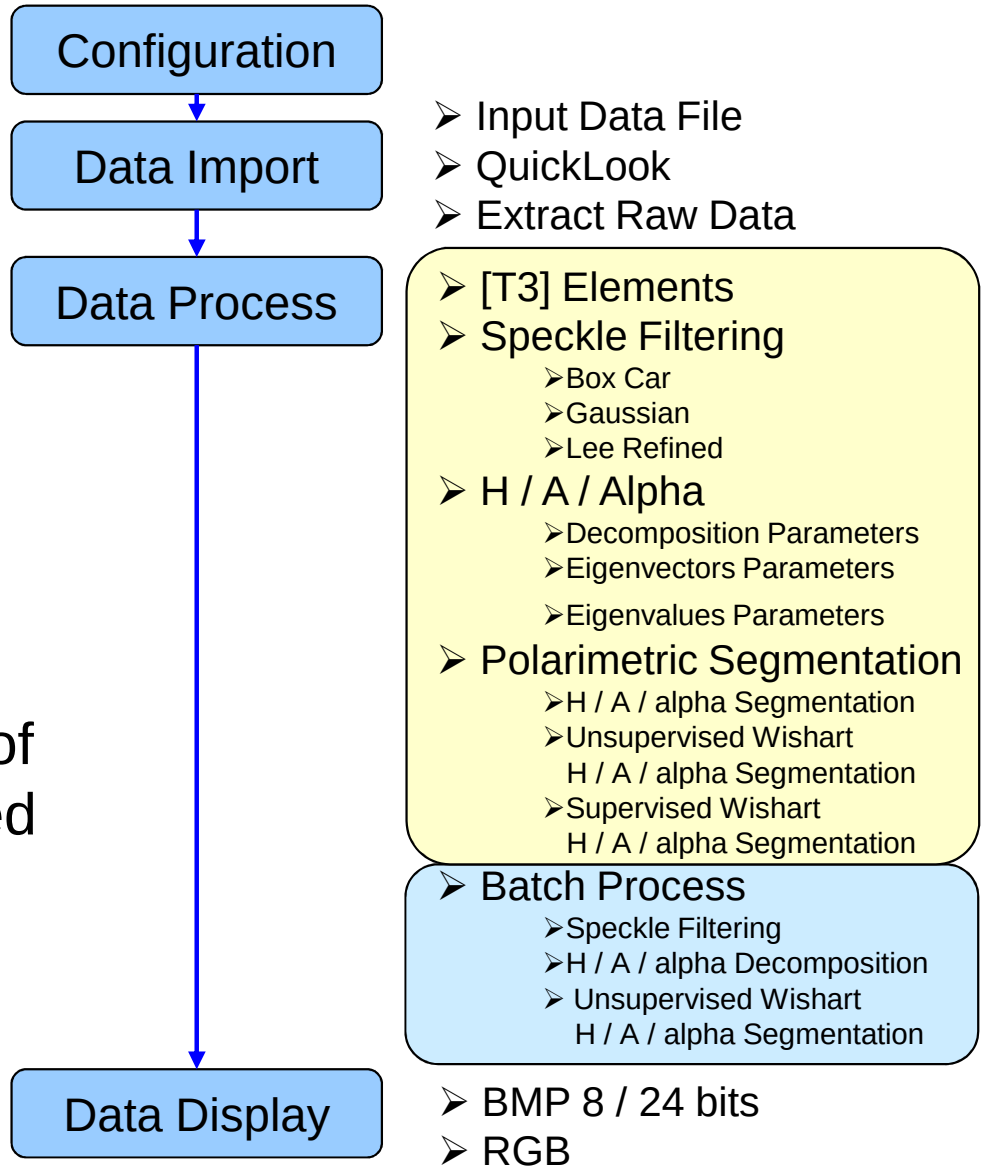
PolSARpro v5.0 SOFTWARE



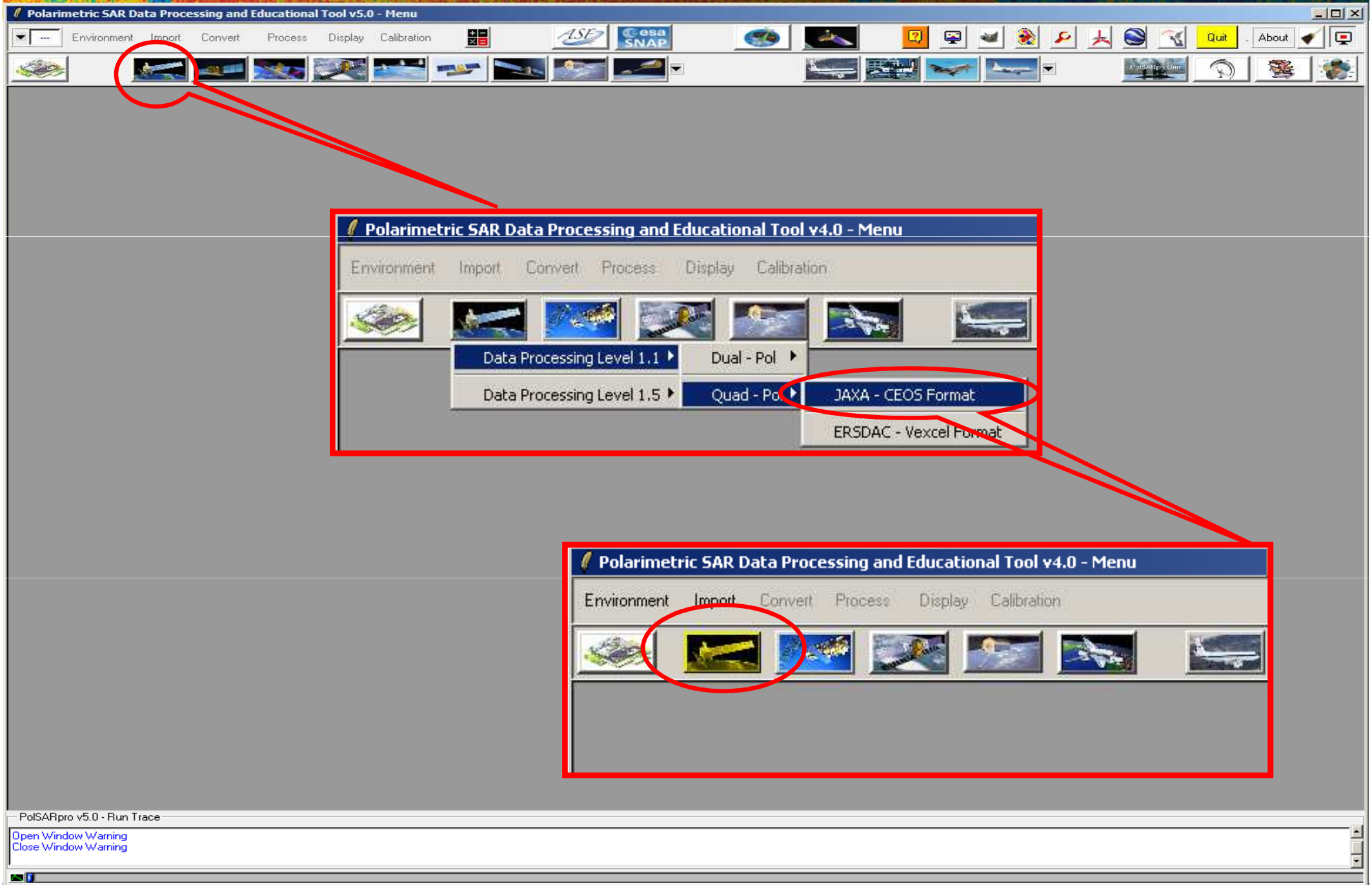
PolSARpro v5.0 Software performs complete end-to-end processing without the need for any other software.

Data Processing Approach along a '**recommended**' and easy processing chain

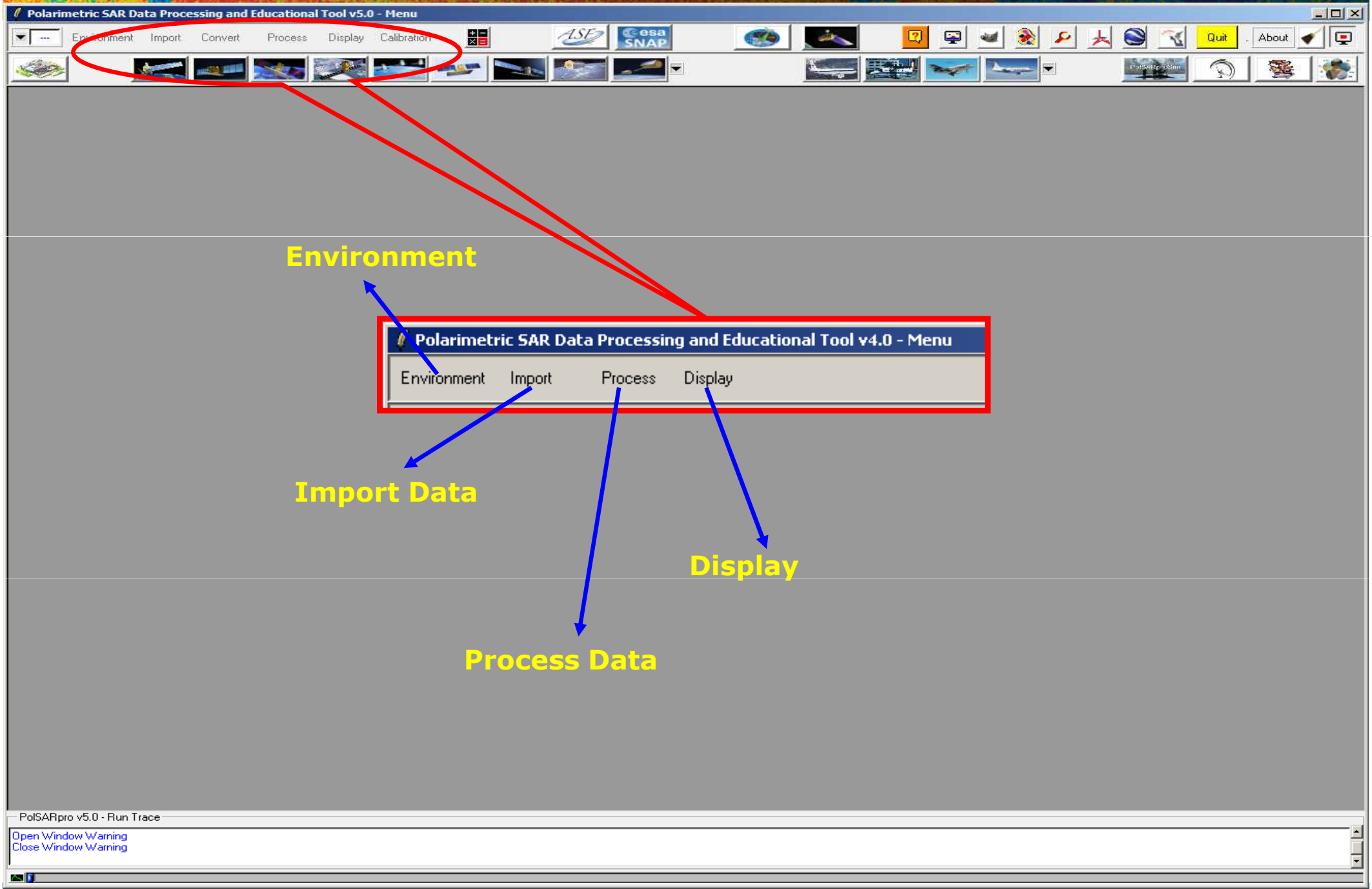
Provide a **First Qualitative Analysis** of the fully polarimetric data set processed



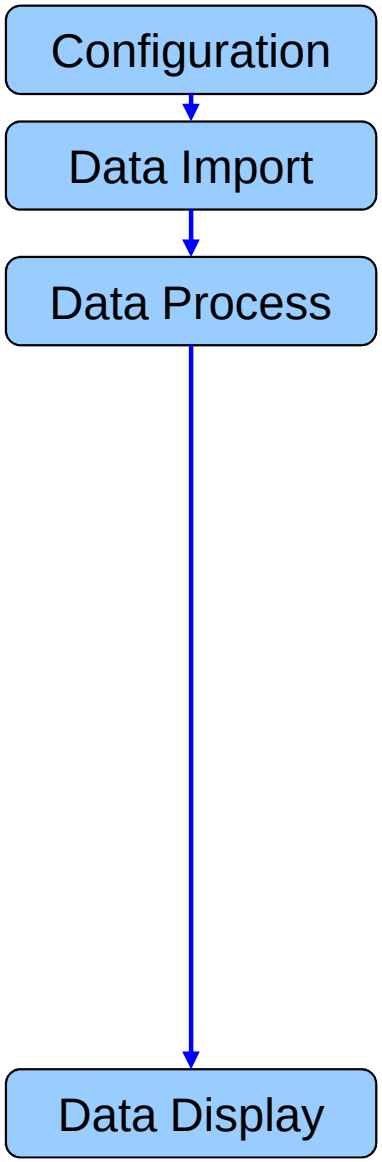
MAIN MENU


Polarimetric SAR Data Processing and Educational Tool v5.0 - Menu
Environment
Import
Convert
Process
Display
Calibration
Quit
About
Polarimetric SAR Data Processing and Educational Tool v4.0 - Menu
Environment
Import
Convert
Process
Display
Calibration
Data Processing Level 1.1
Data Processing Level 1.5
Dual - Pol
Quad - Pol
JAXA - CEOS Format
ERSDAC - Vexcel Format
Polarimetric SAR Data Processing and Educational Tool v4.0 - Menu
Environment
Import
Convert
Process
Display
Calibration
PolSARpro v5.0 - Run Trace
Open Window Warning
Close Window Warning

MAIN MENU


Polarimetric SAR Data Processing and Educational Tool v5.0 - Menu
Environment
Import
Convert
Process
Display
Calibration
Quit
About
Environment
Import Data
Display
Process Data
Polarimetric SAR Data Processing and Educational Tool v4.0 - Menu
Environment
Import
Process
Display
PolSARpro v5.0 - Run Trace
Open Window Warning
Close Window Warning

PROCESSING CHAIN

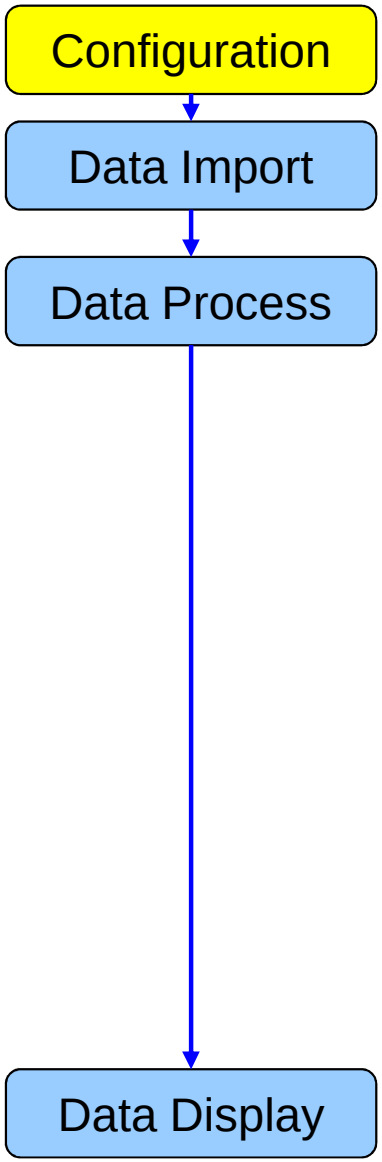


- Input Data File
- QuickLook
- Extract Raw Data

- [T3] Elements
- Speckle Filtering
  - Box Car
  - Gaussian
  - Lee Refined
- H / A / Alpha
  - Decomposition Parameters
  - Eigenvectors Parameters
  - Eigenvalues Parameters
- Polarimetric Segmentation
  - H / A / alpha Segmentation
  - Unsupervised Wishart H / A / alpha Segmentation
  - Supervised Wishart H / A / alpha Segmentation
- Batch Process
  - Speckle Filtering
  - H / A / alpha Decomposition
  - Unsupervised Wishart H / A / alpha Segmentation

- BMP 8 / 24 bits
- RGB

PROCESSING CHAIN

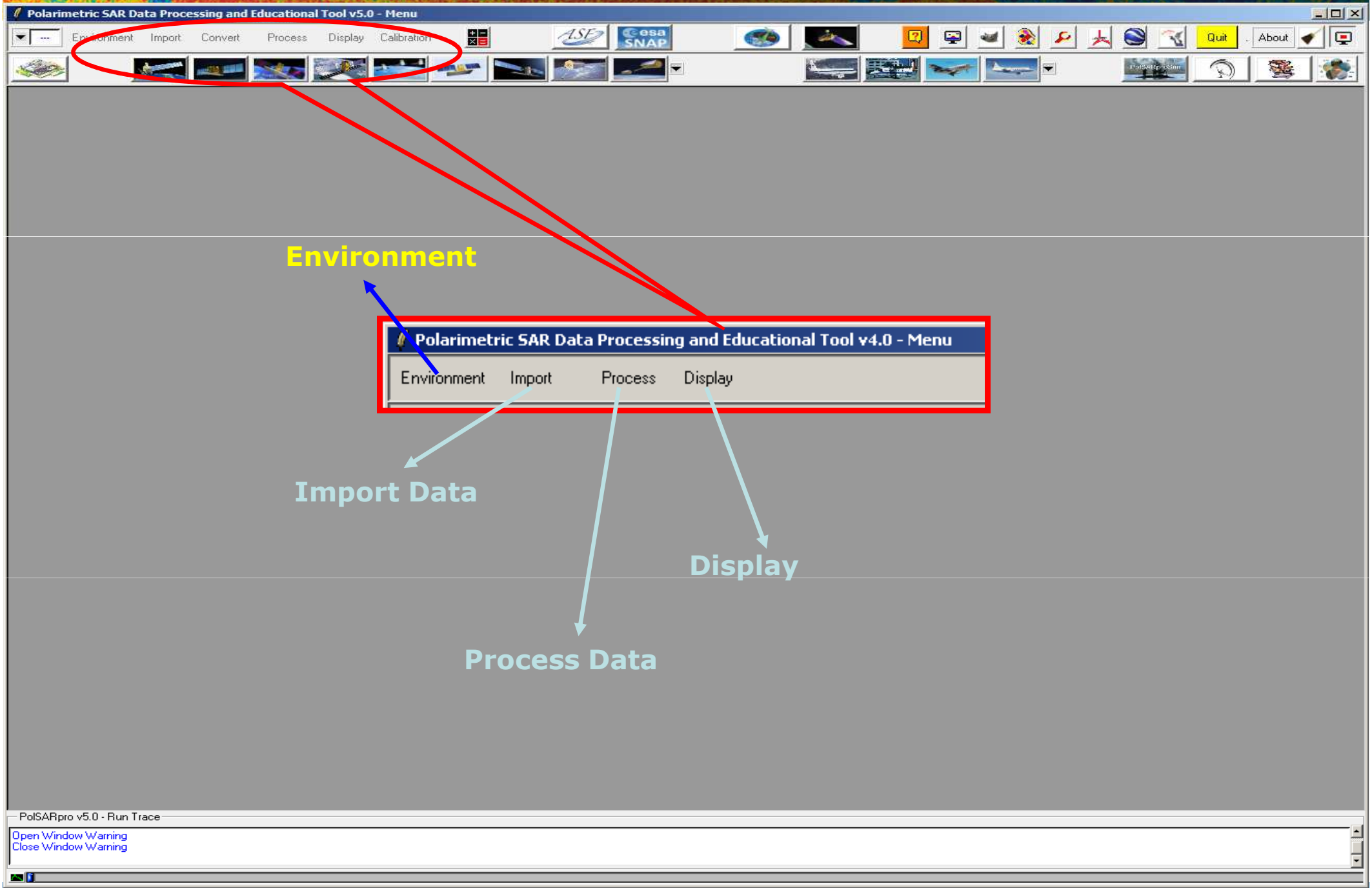


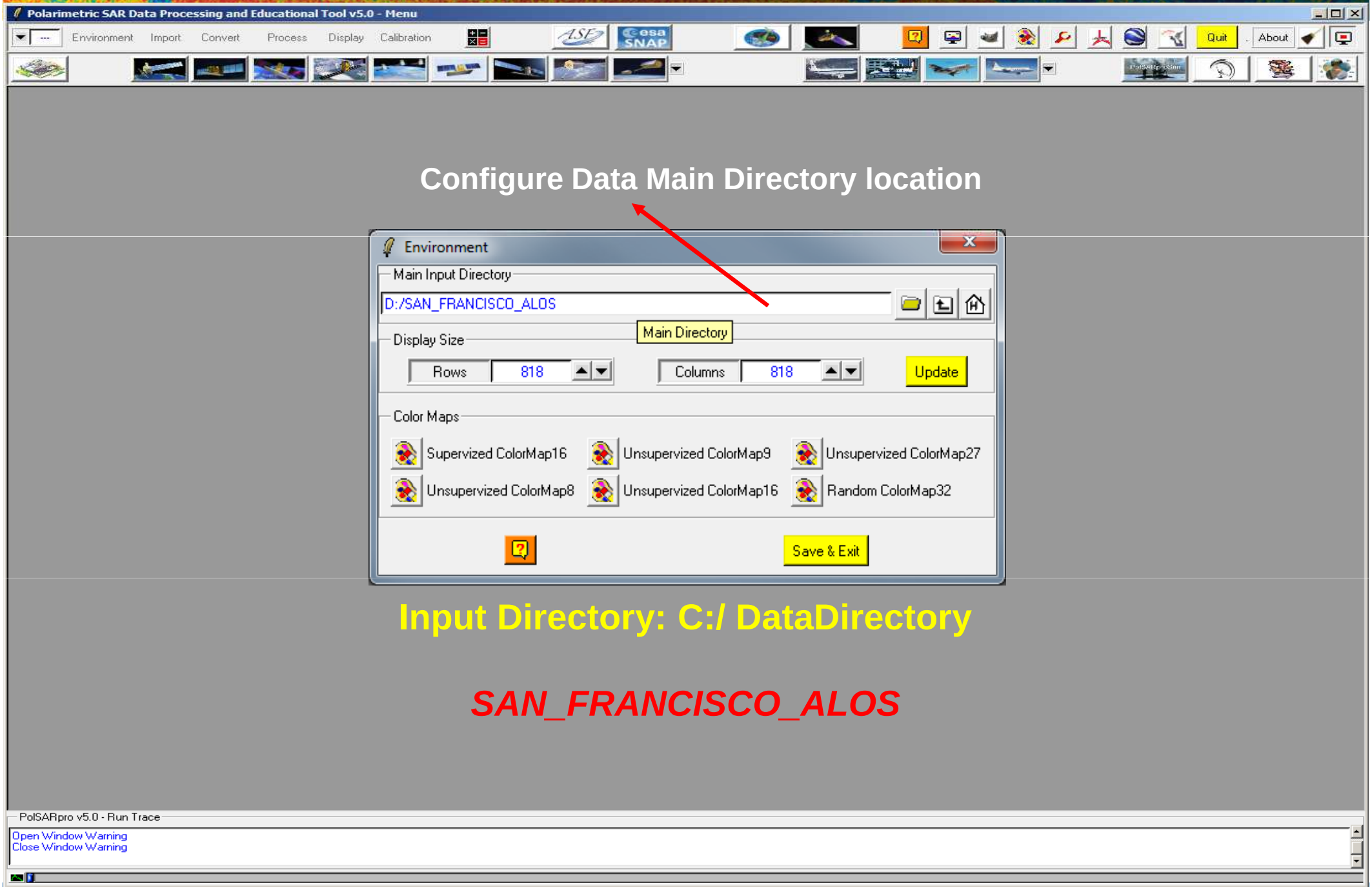
- Input Data File
- QuickLook
- Extract Raw Data

- [T3] Elements
- Speckle Filtering
  - Box Car
  - Gaussian
  - Lee Refined
- H / A / Alpha
  - Decomposition Parameters
  - Eigenvectors Parameters
  - Eigenvalues Parameters
- Polarimetric Segmentation
  - H / A / alpha Segmentation
  - Unsupervised Wishart H / A / alpha Segmentation
  - Supervised Wishart H / A / alpha Segmentation
- Batch Process
  - Speckle Filtering
  - H / A / alpha Decomposition
  - Unsupervised Wishart H / A / alpha Segmentation

- BMP 8 / 24 bits
- RGB

ENVIRONNEMENT

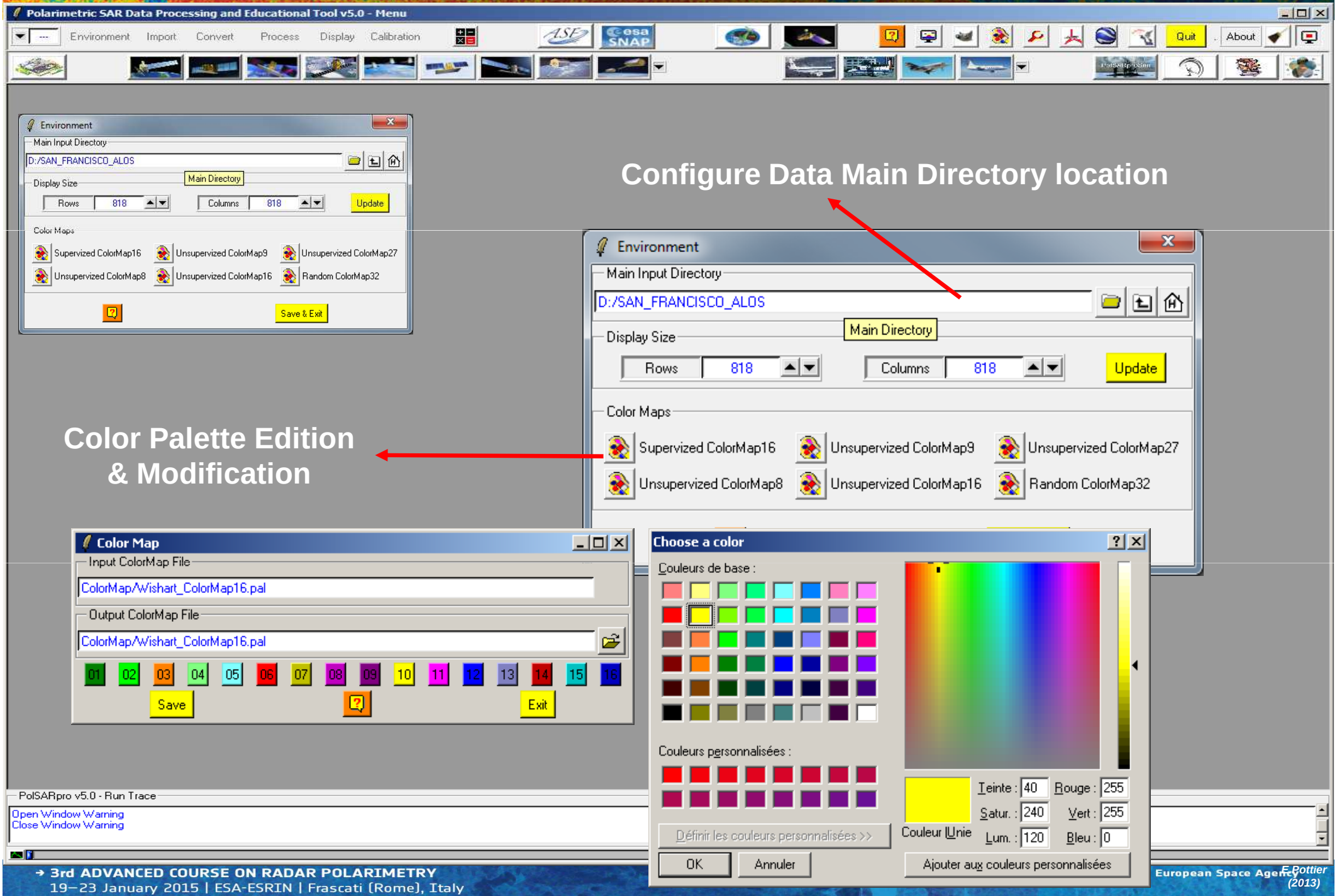




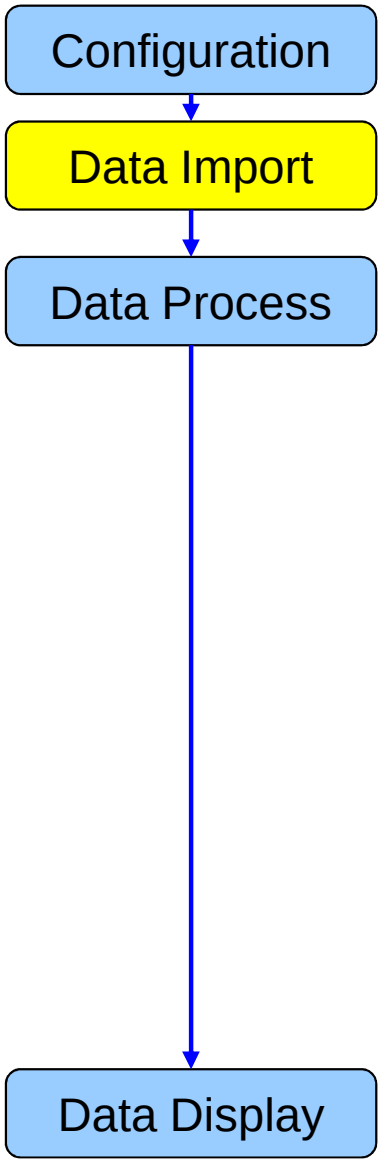
Input Directory: C:/ DataDirectory

SAN_FRANCISCO_ALOS

ENVIRONMENT



PROCESSING CHAIN

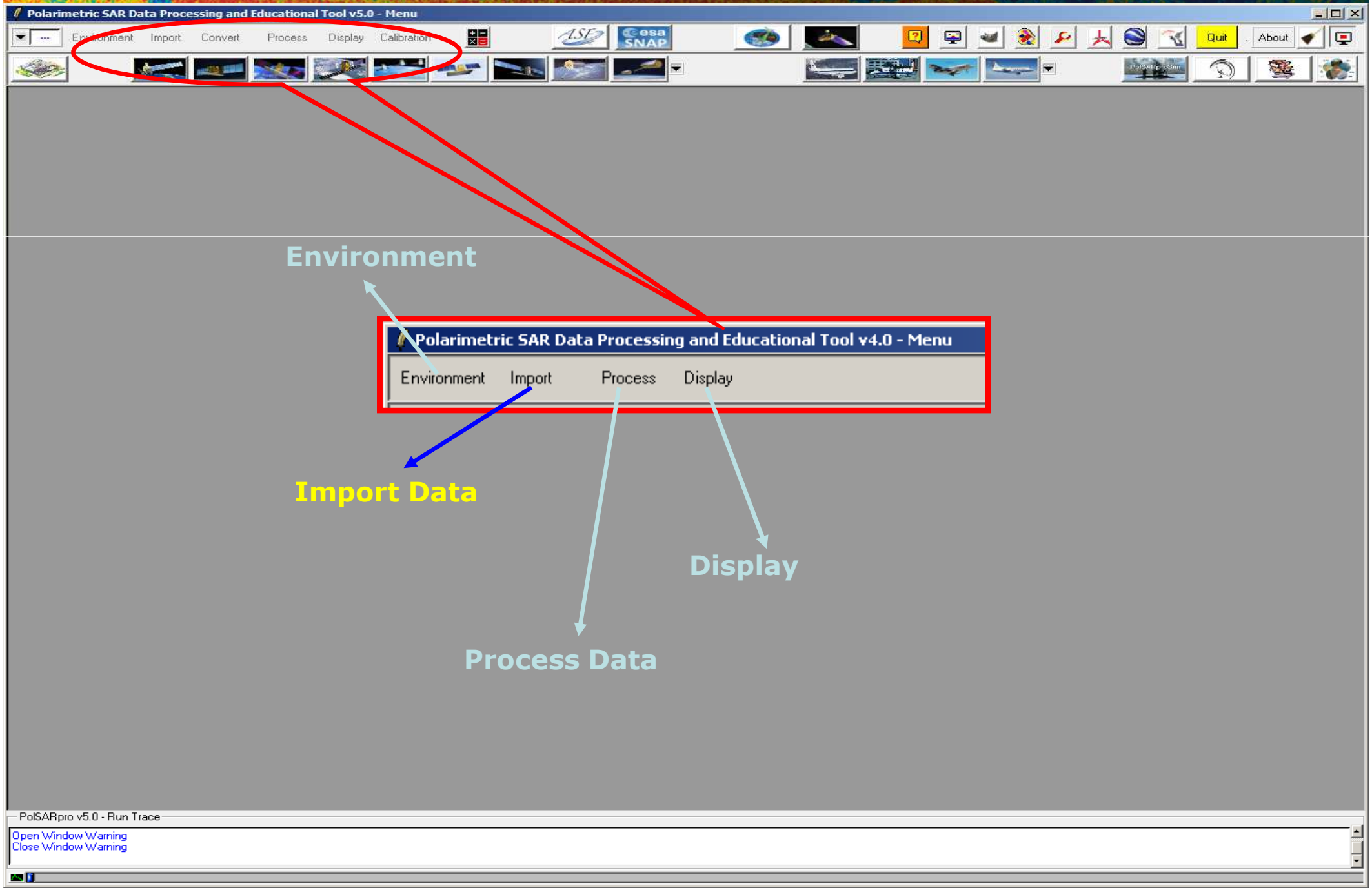


- Input Data File
- QuickLook
- Extract Raw Data

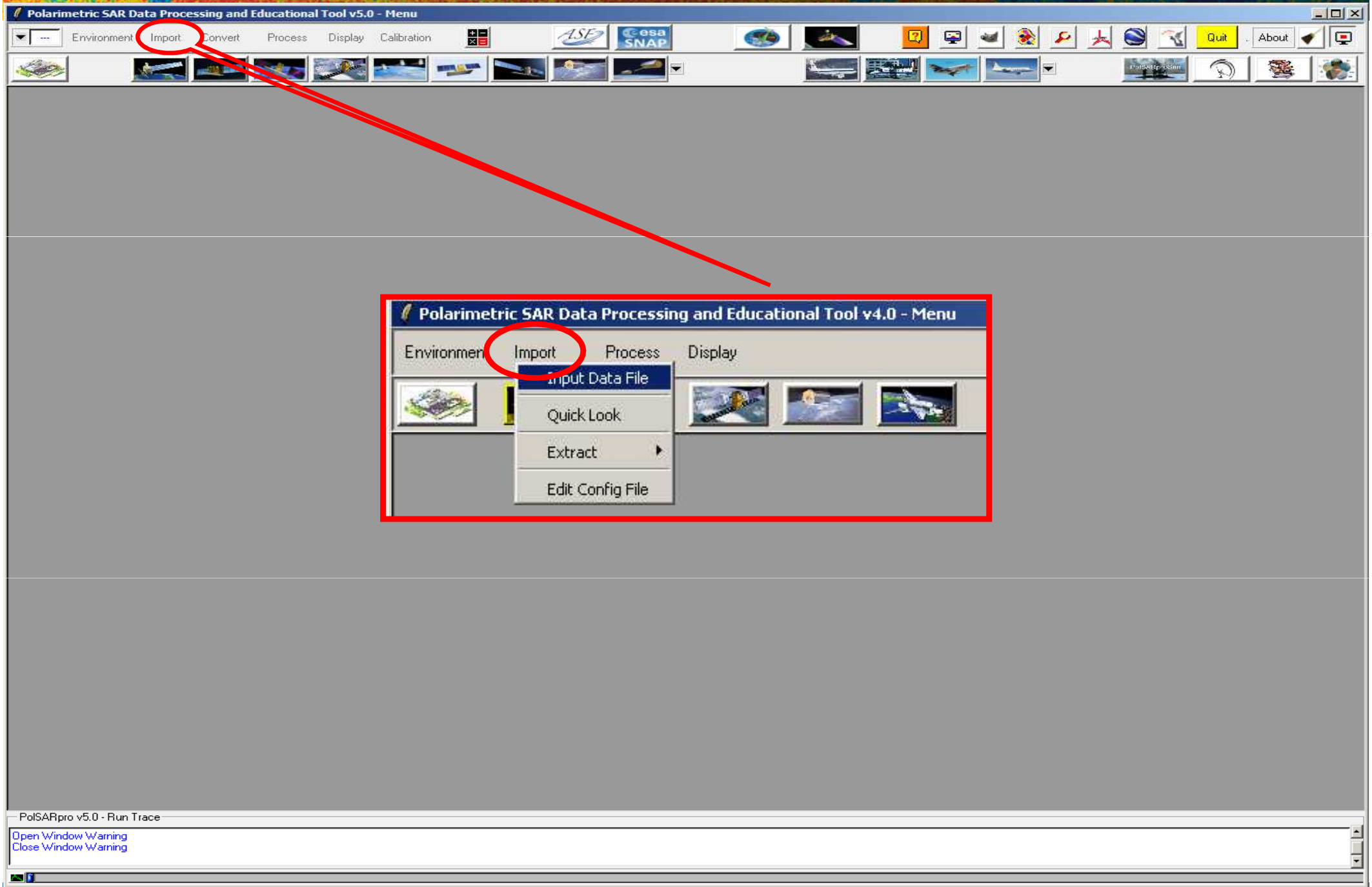
- [T3] Elements
- Speckle Filtering
  - Box Car
  - Gaussian
  - Lee Refined
- H / A / Alpha
  - Decomposition Parameters
  - Eigenvectors Parameters
  - Eigenvalues Parameters
- Polarimetric Segmentation
  - H / A / alpha Segmentation
  - Unsupervised Wishart H / A / alpha Segmentation
  - Supervised Wishart H / A / alpha Segmentation
- Batch Process
  - Speckle Filtering
  - H / A / alpha Decomposition
  - Unsupervised Wishart H / A / alpha Segmentation

- BMP 8 / 24 bits
- RGB

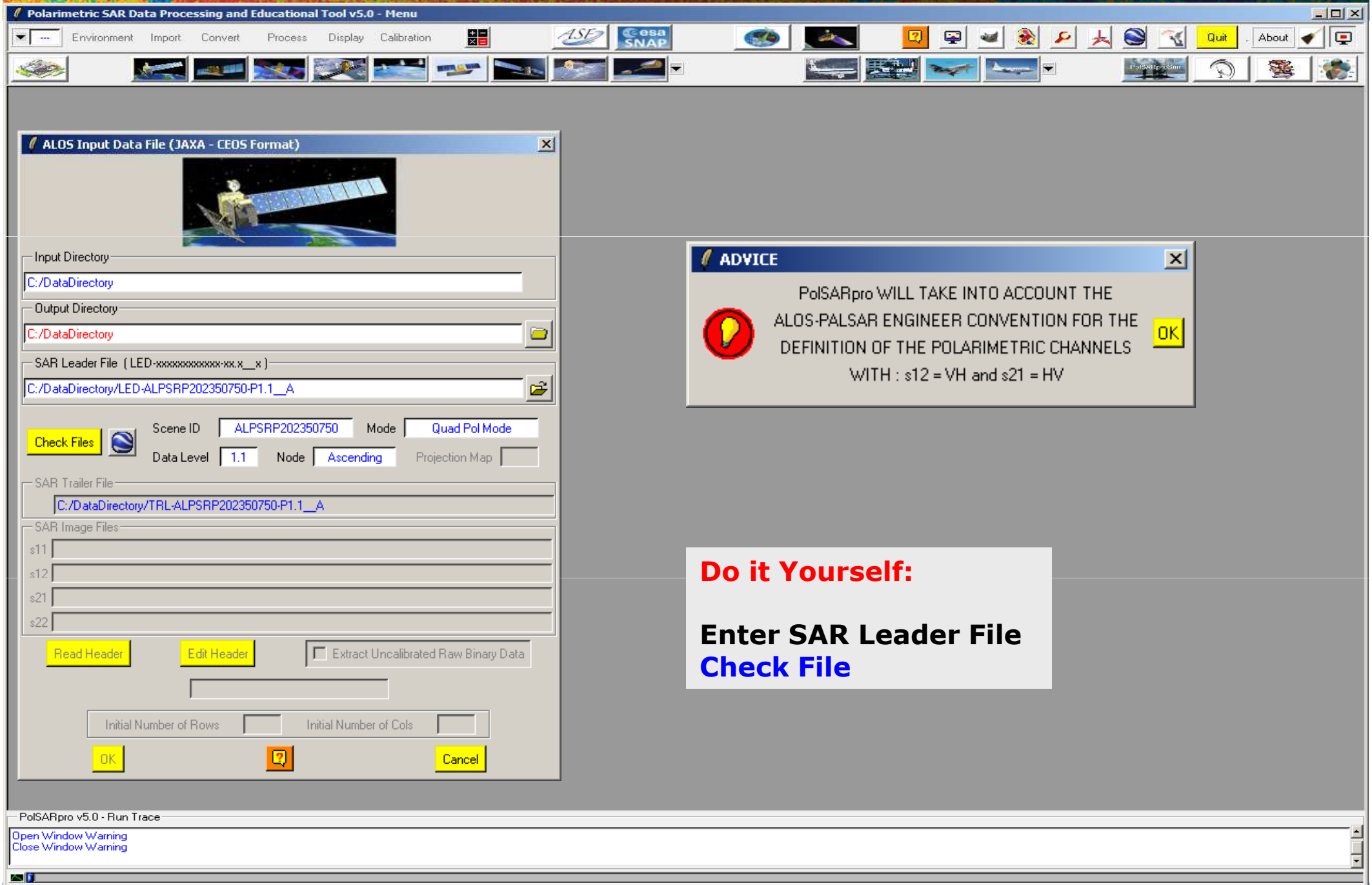
ENVIRONNEMENT



Data IMPORT – Input Data File



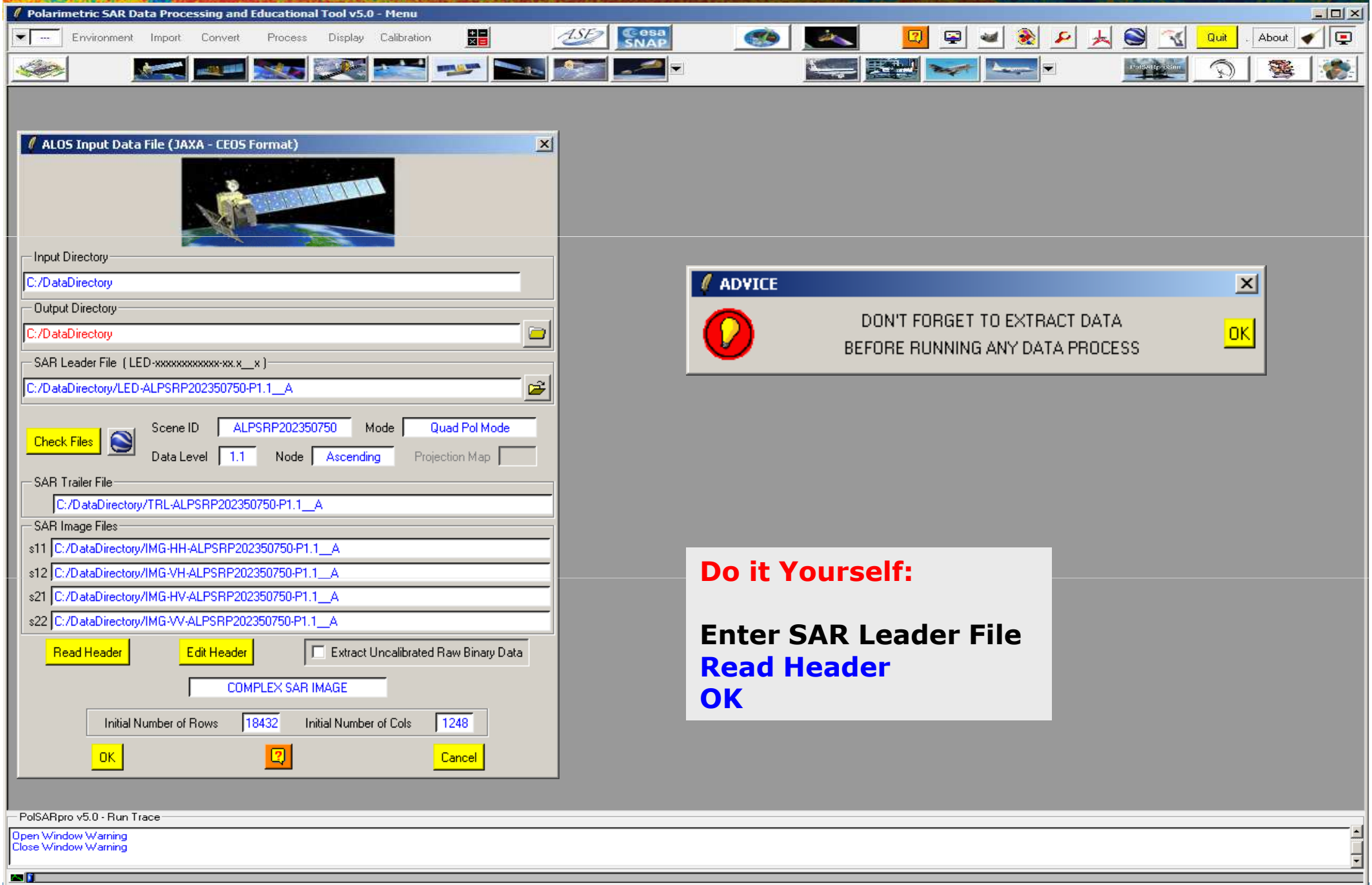
Data IMPORT – Input Data File



Do it Yourself:

Enter SAR Leader File
Check File

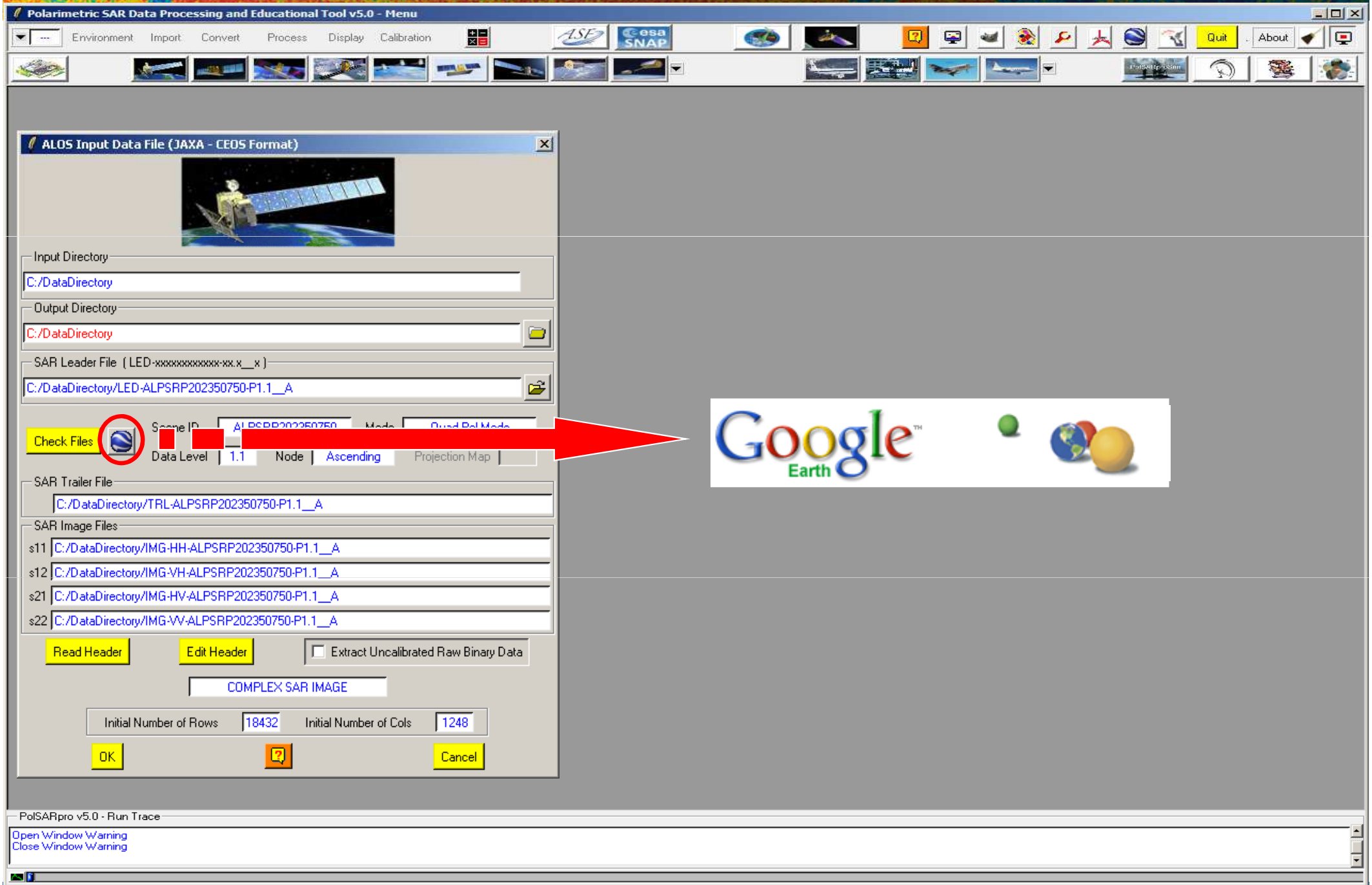
Data IMPORT – Input Data File



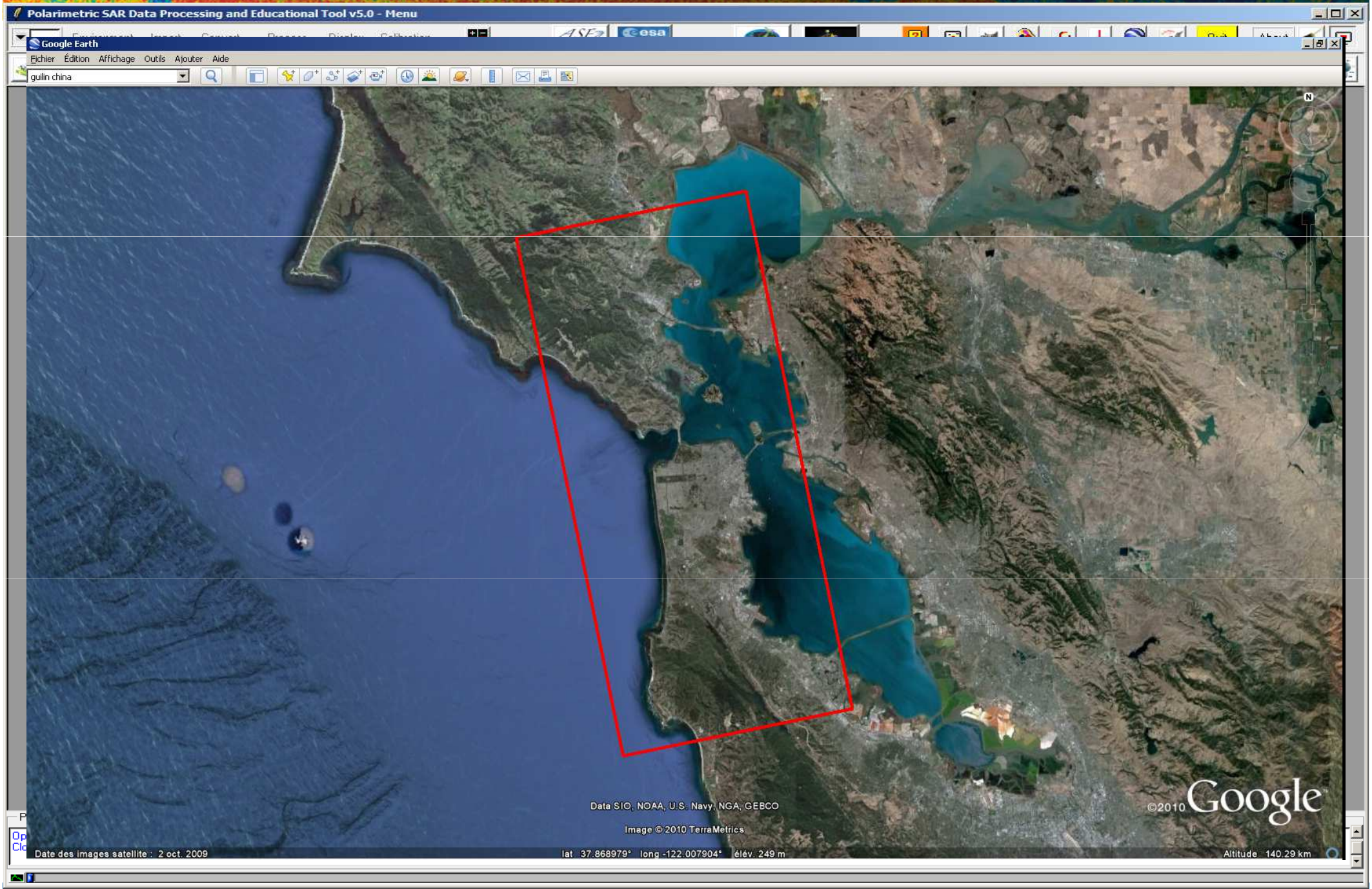
Do it Yourself:

Enter SAR Leader File
Read Header
OK

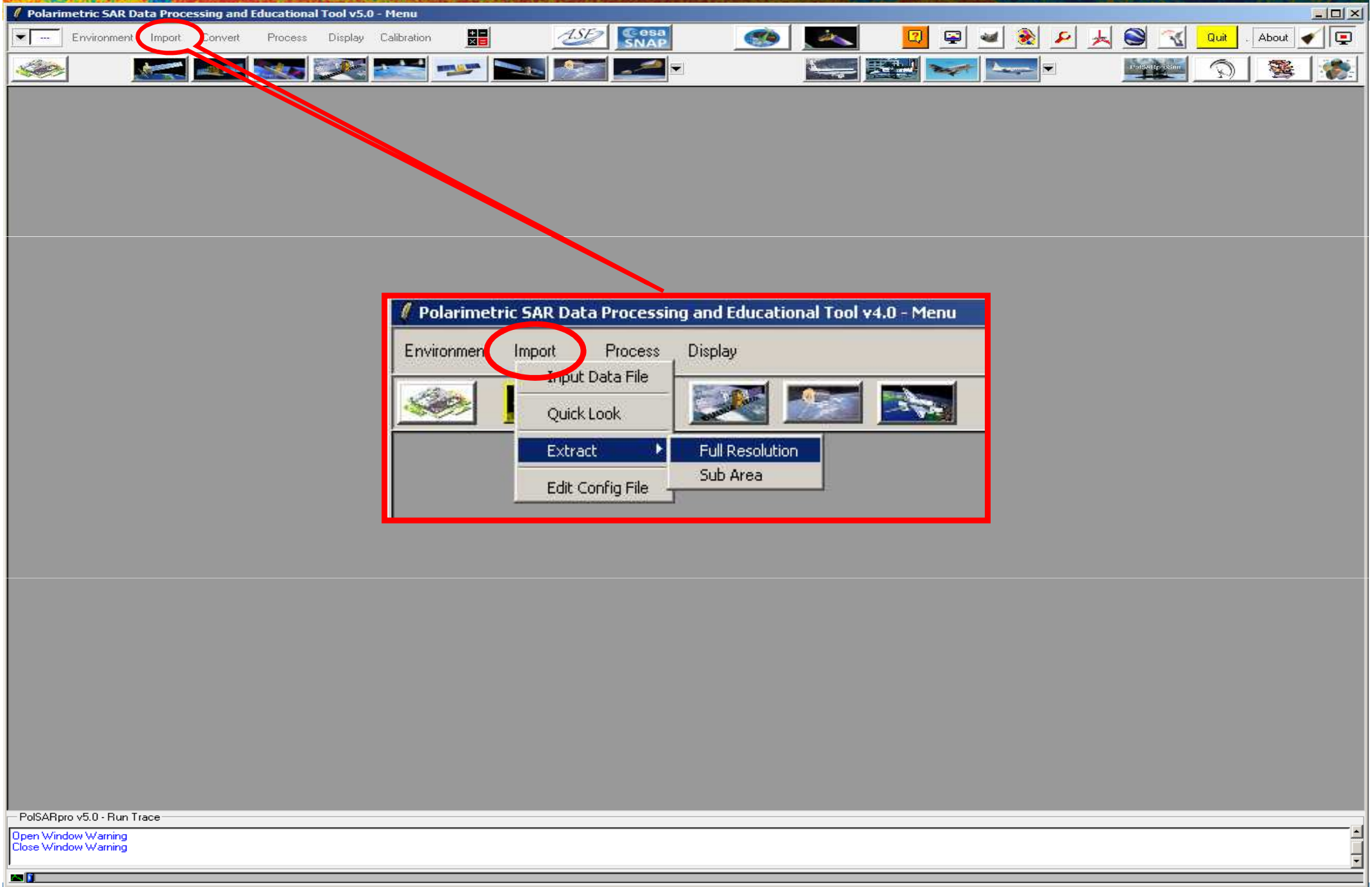
Data IMPORT – Input Data File



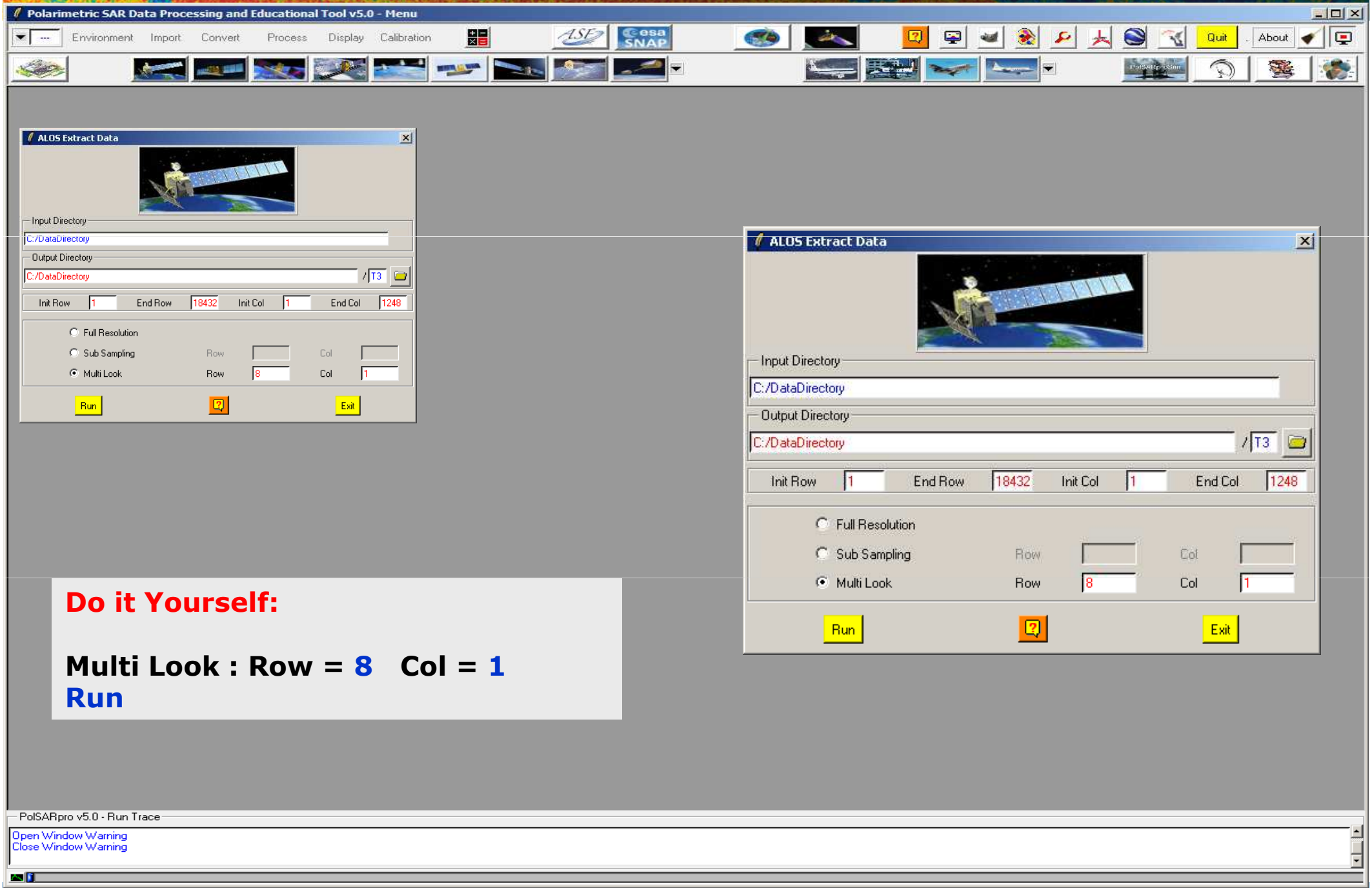
Data IMPORT – Input Data File



Data IMPORT – Extract Binary Data



Data IMPORT – Extract Binary Data

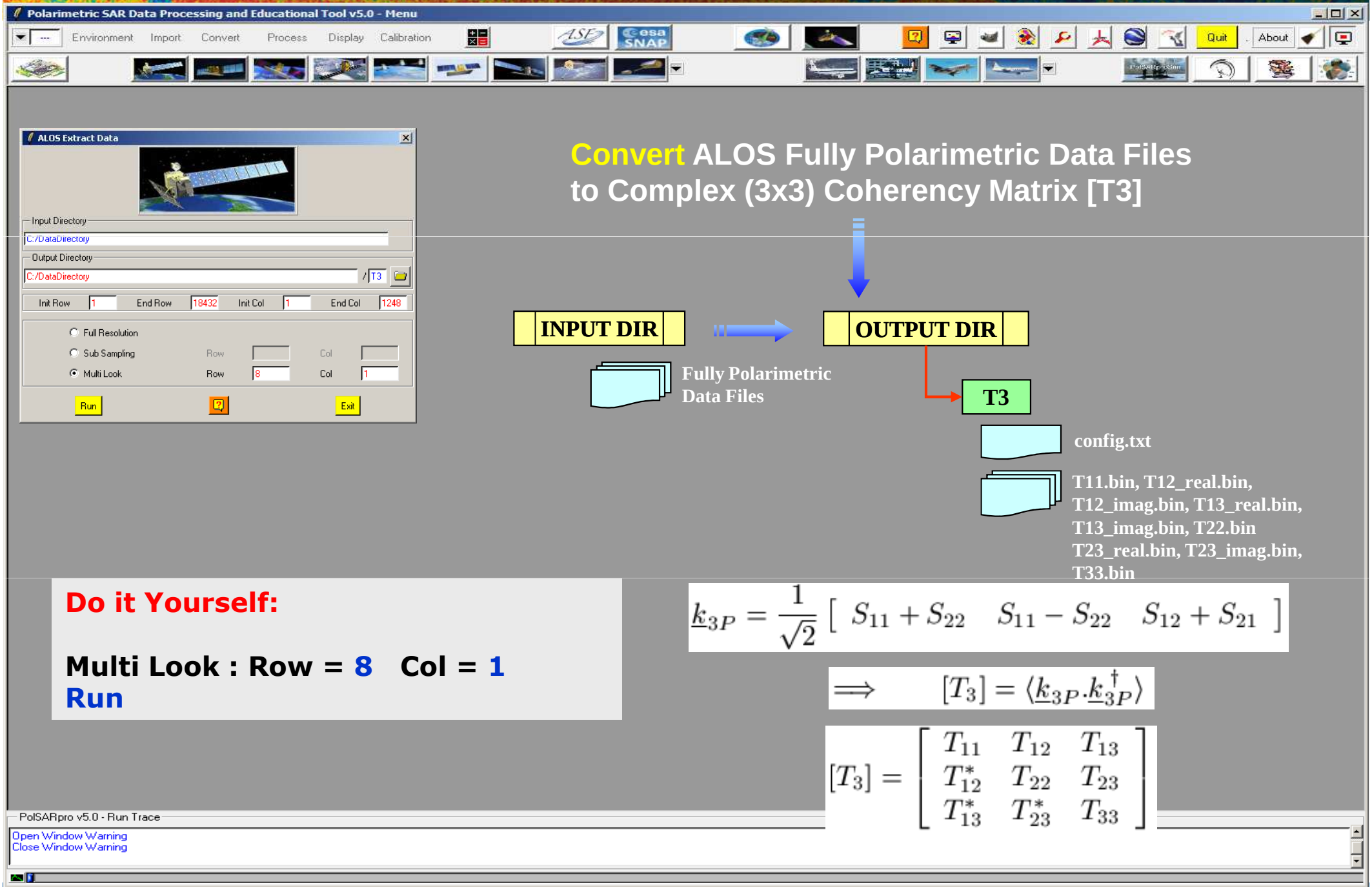


Do it Yourself:

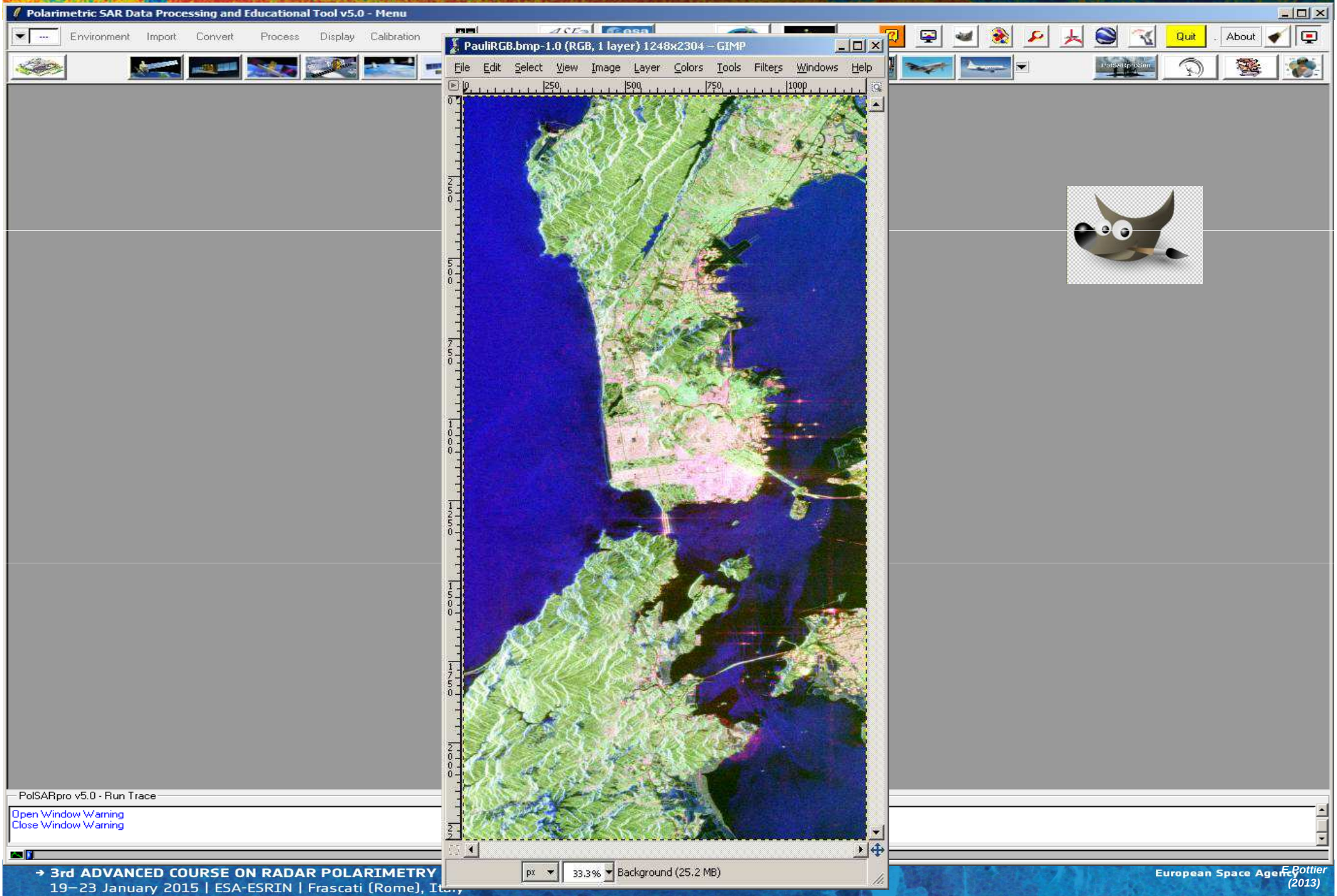
Multi Look : Row = 8 Col = 1

Run

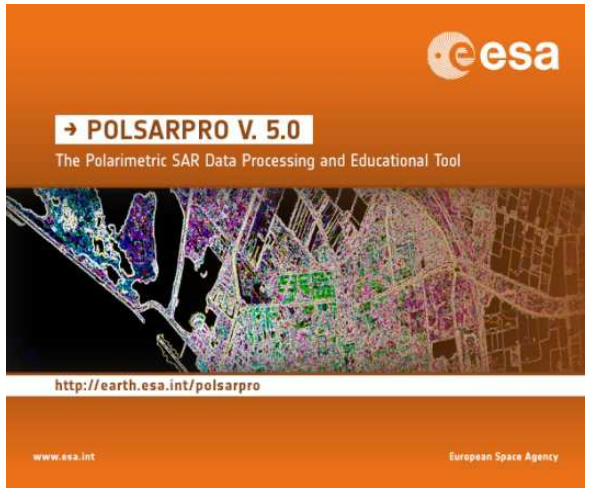
Data IMPORT – Extract Binary Data



Display Pauli-RGB Image



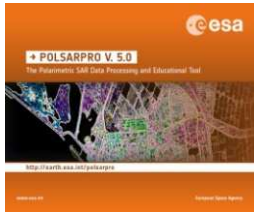
PolSARpro v5.0 – MAP READY SOFTWARES



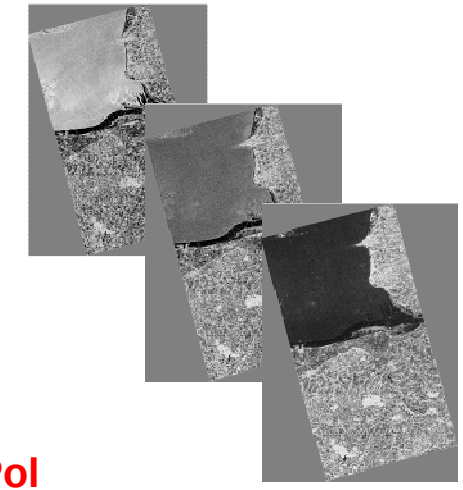
PolSARpro v5.0 SOFTWARE

ALOS - PALSAR

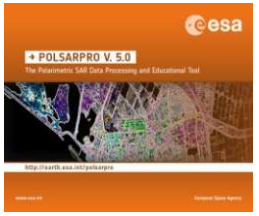
Pre-Processing
Data Extract [*T3*]

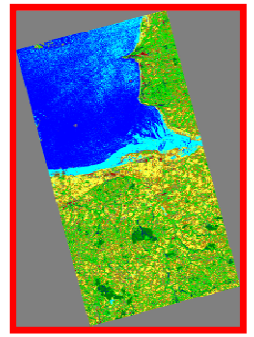


Geo-Coding
Terrain Correct - UTM Proj.



Post - Processing

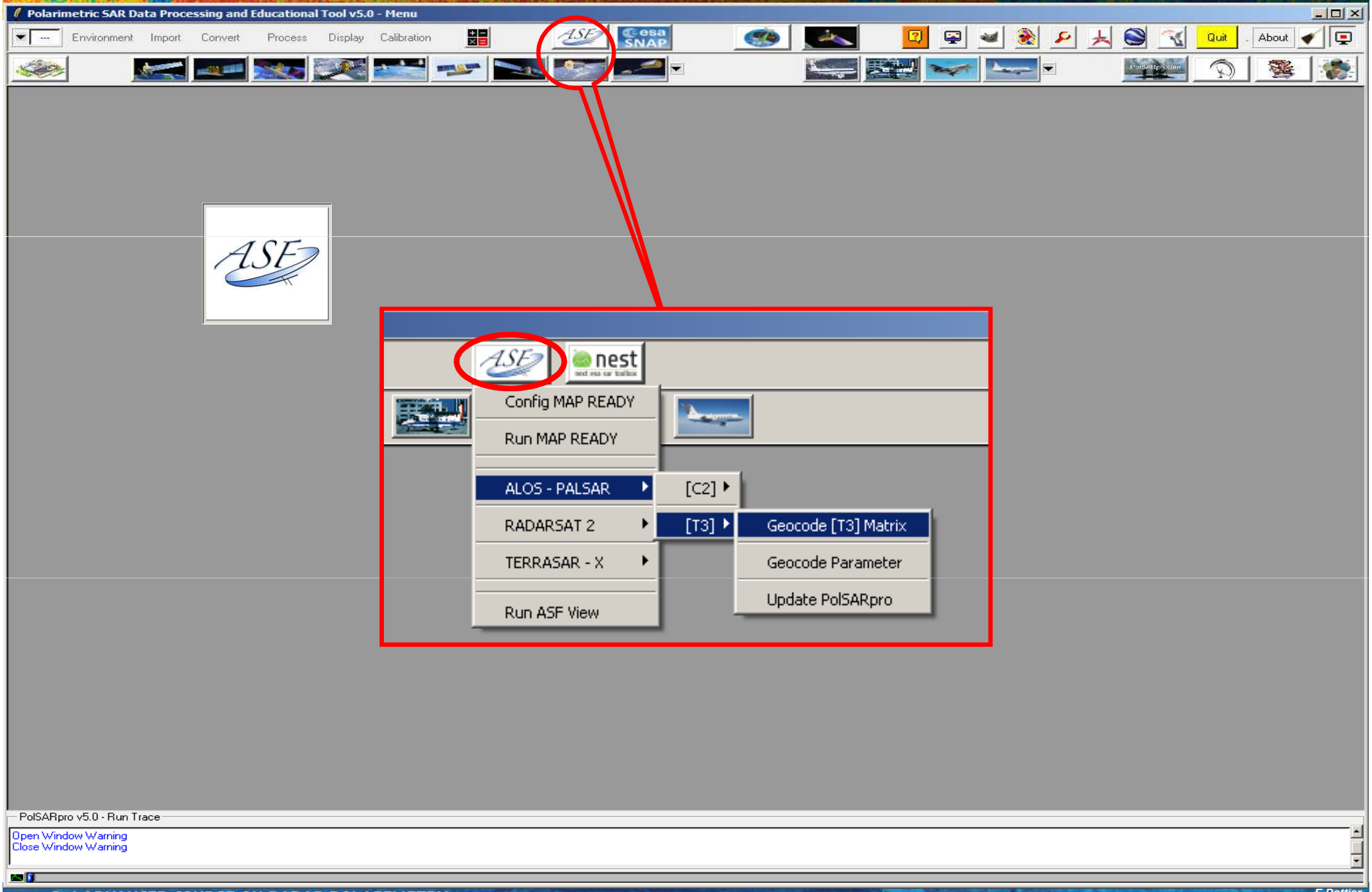




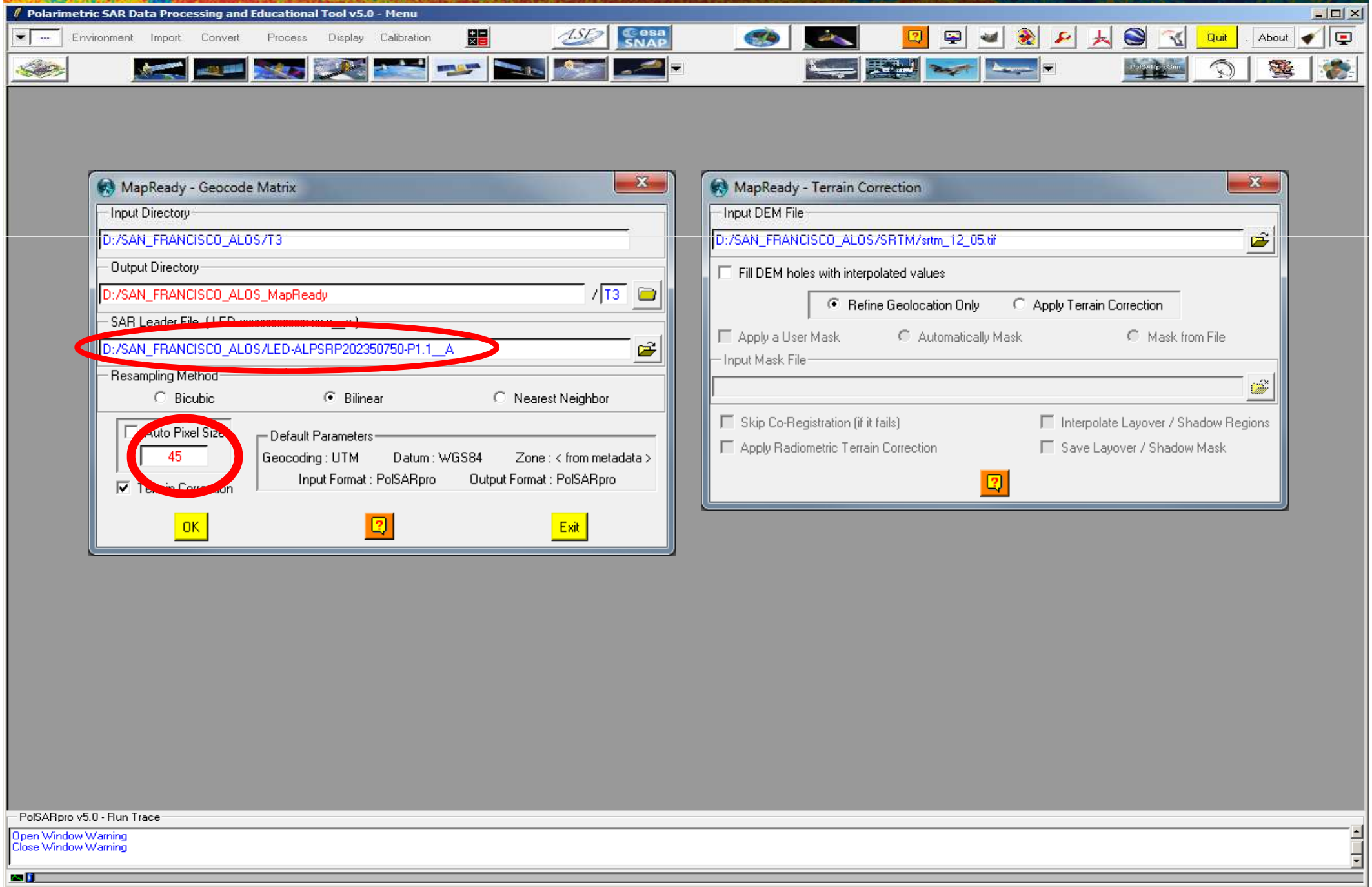
Only valid for:
[C2] matrix: Dual-Pol
[T3] matrix: Quad-Pol

KML File generation

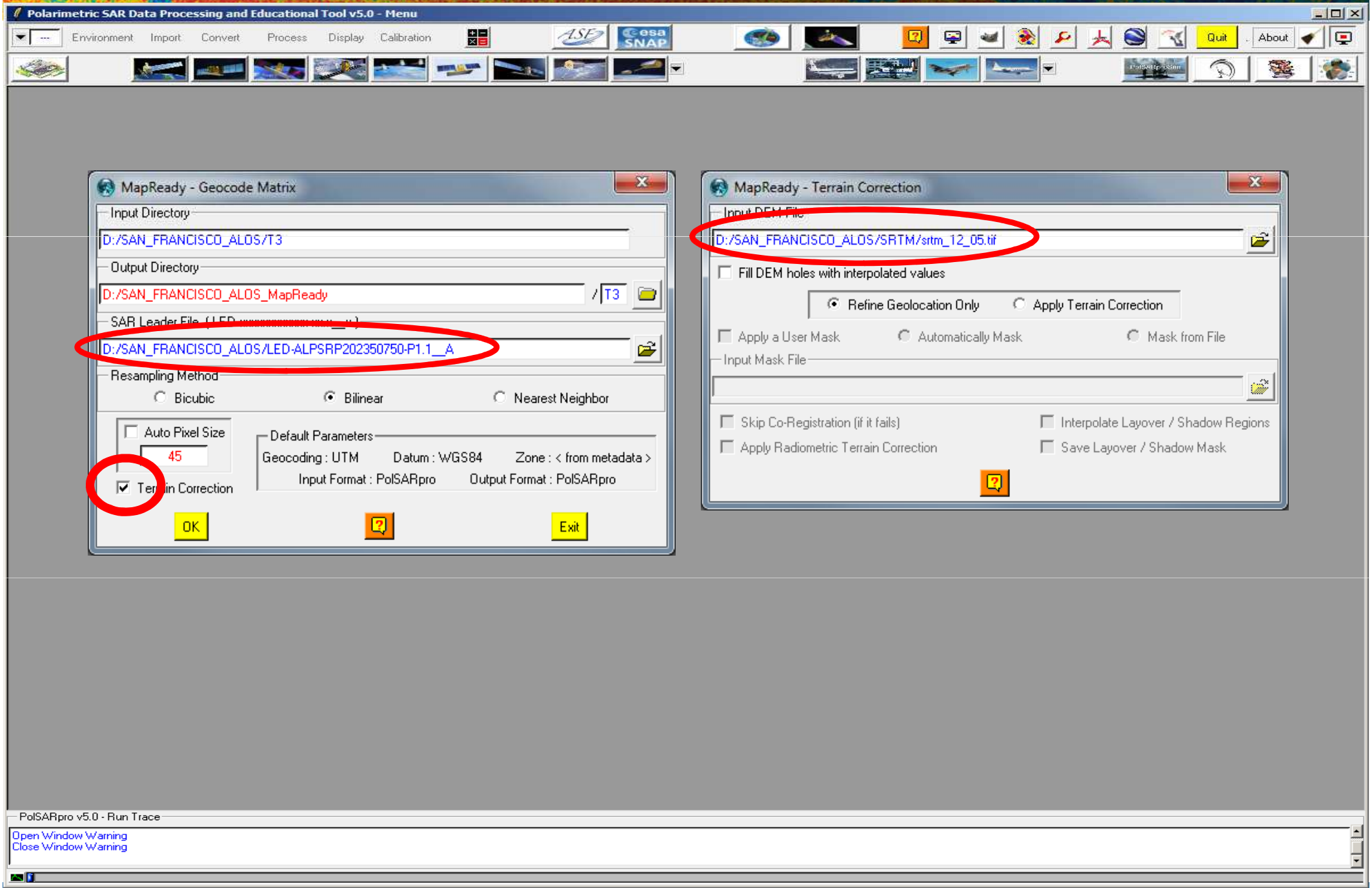
PolSARpro v5.0 SOFTWARE



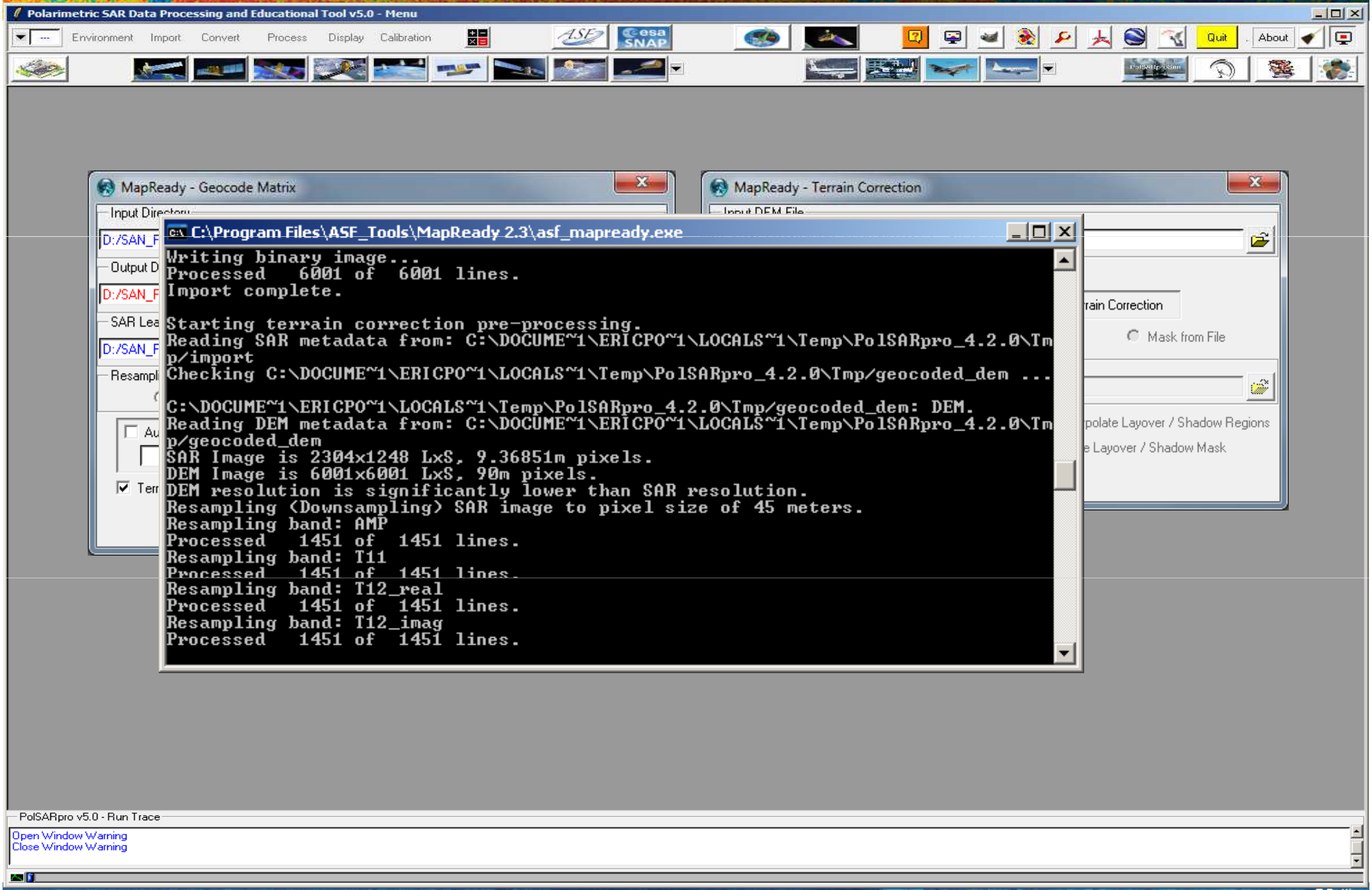
PolSARpro v5.0 SOFTWARE



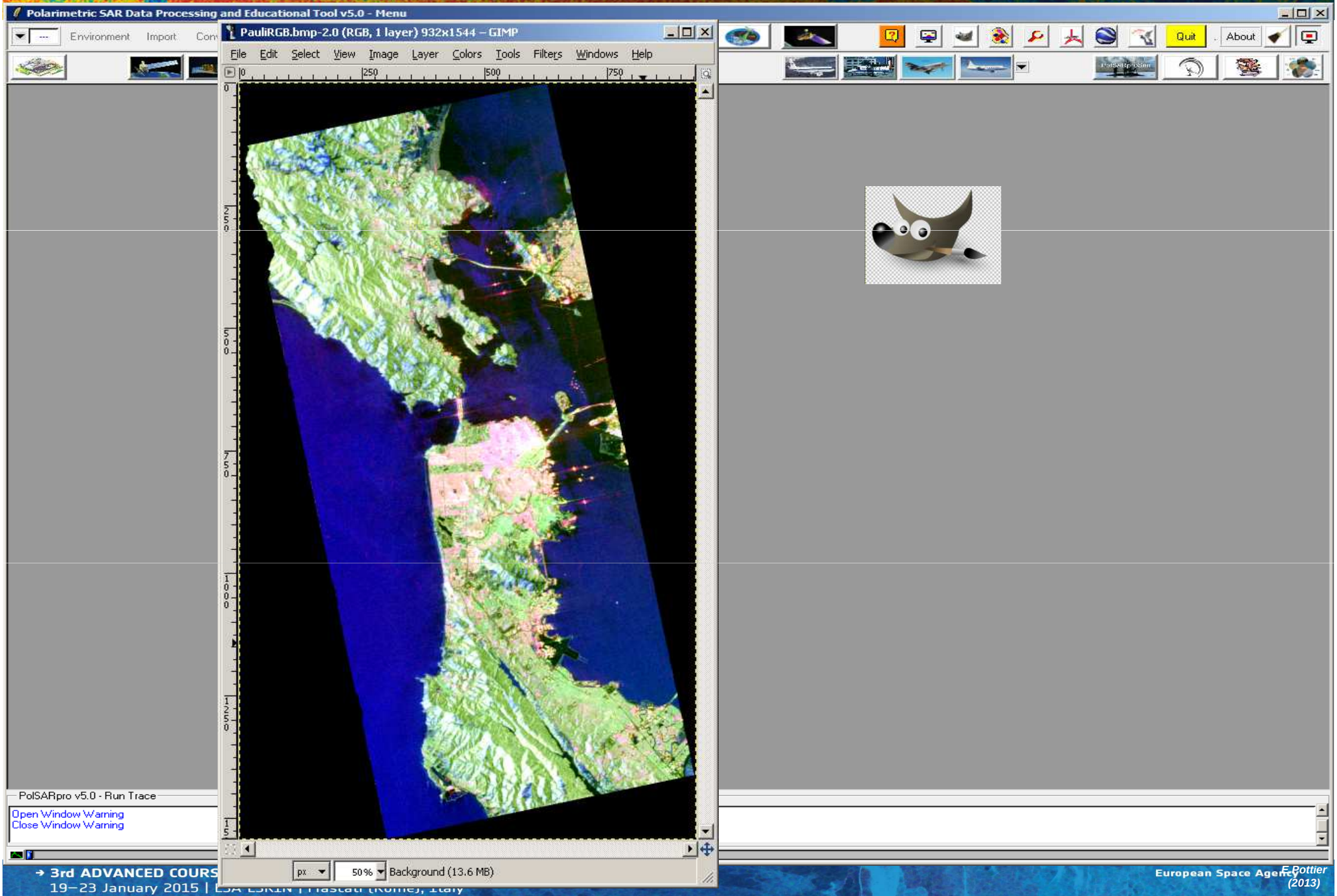
PolSARpro v5.0 SOFTWARE



PolSARpro v5.0 SOFTWARE

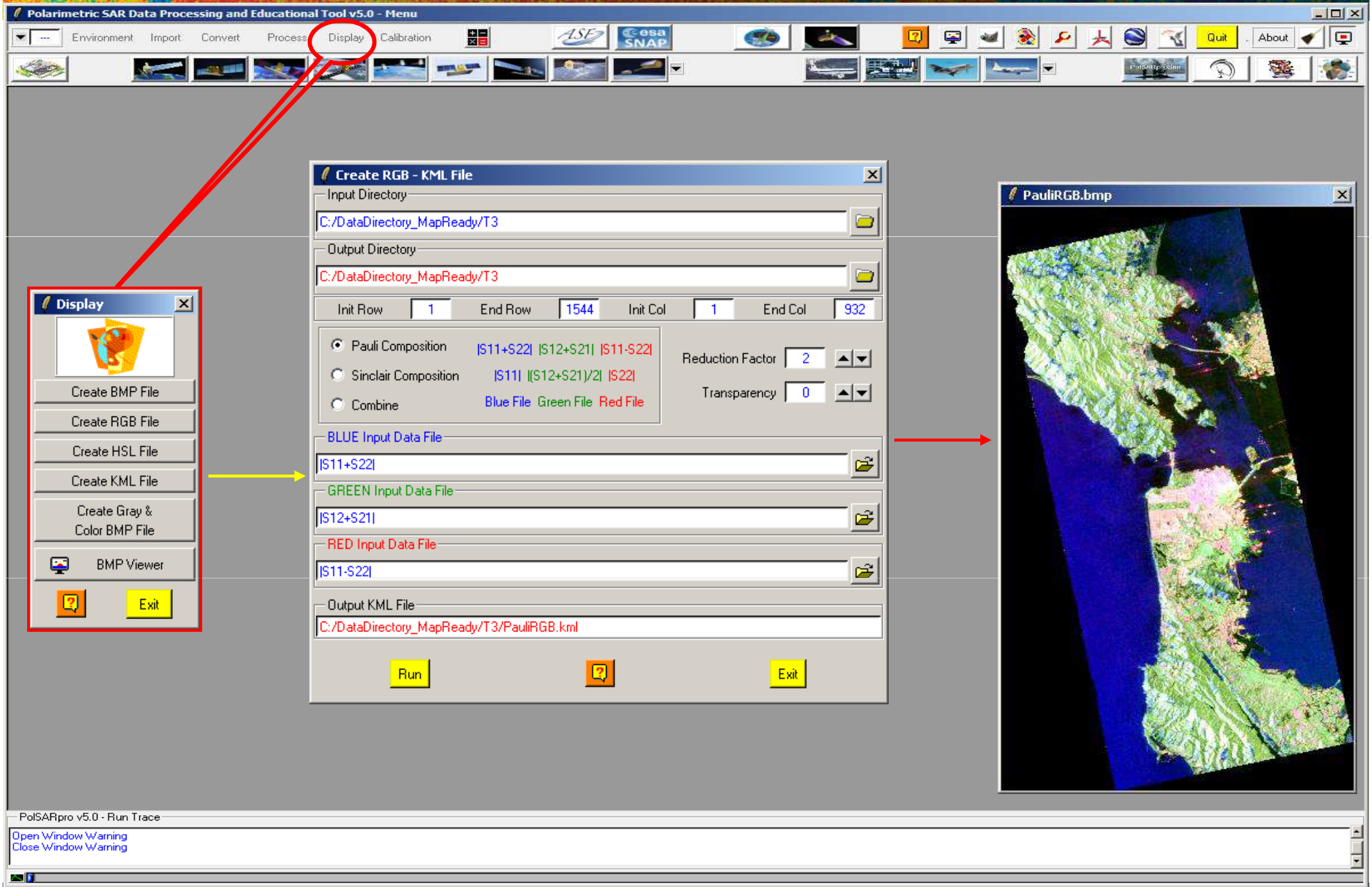


Display Pauli-RGB Image

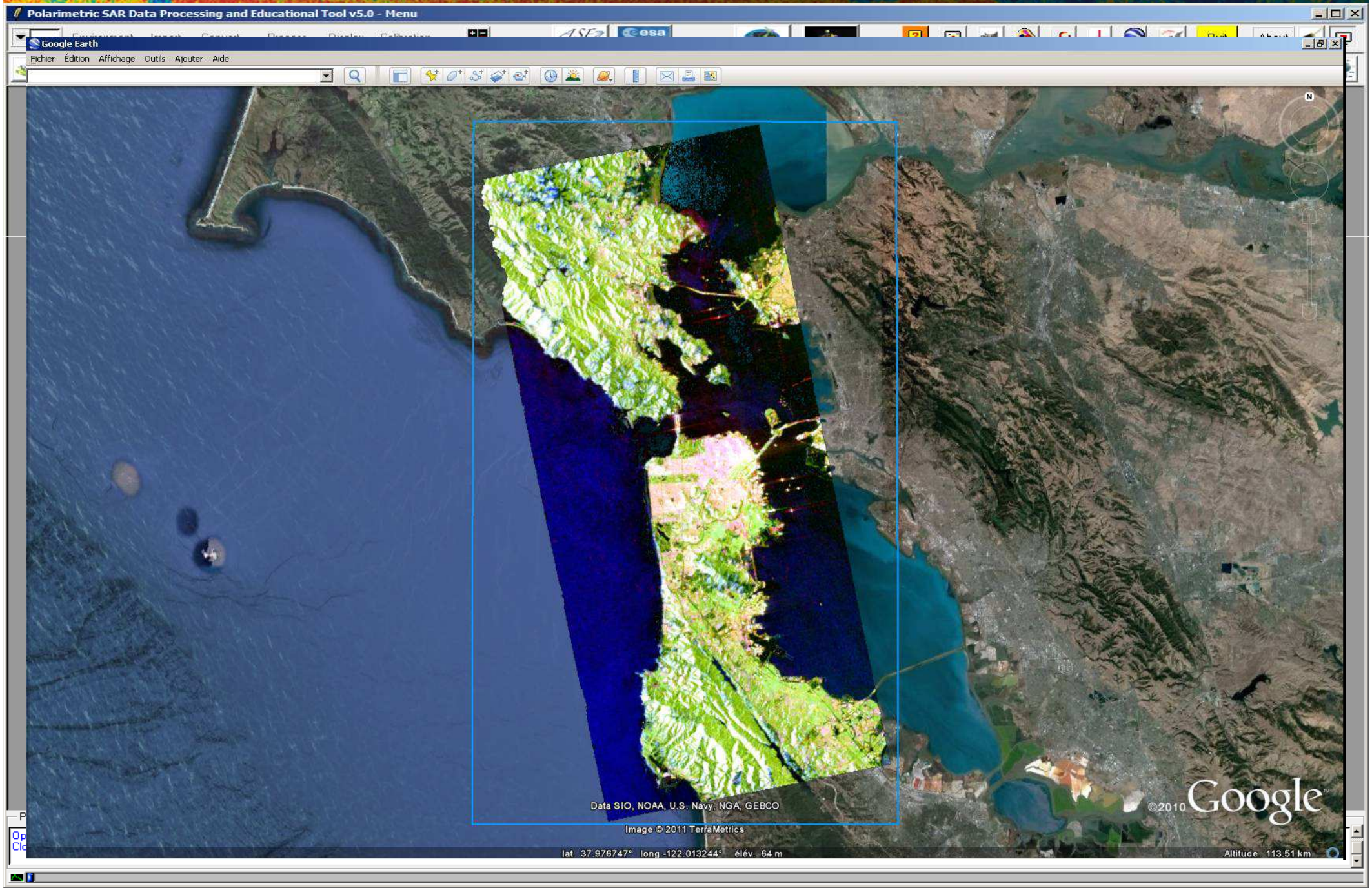


E Pottier (2013)

Create Pauli-RGB to KML Image

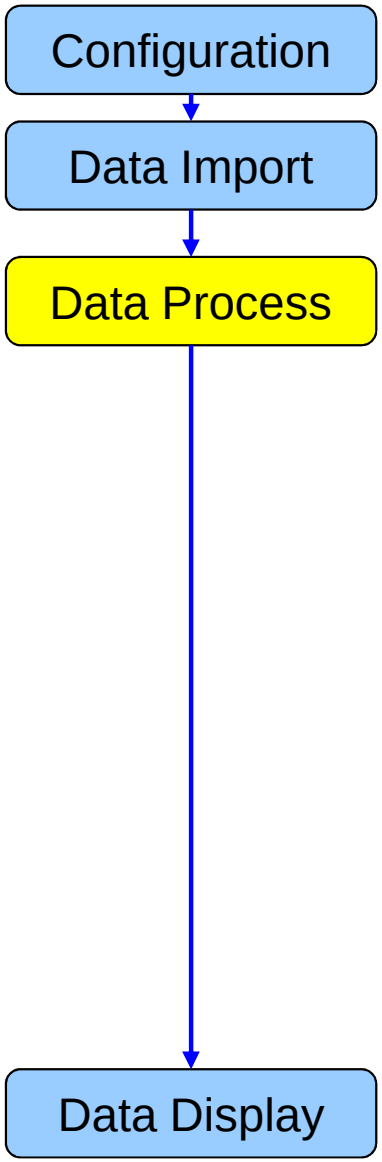


GOOGLE EARTH



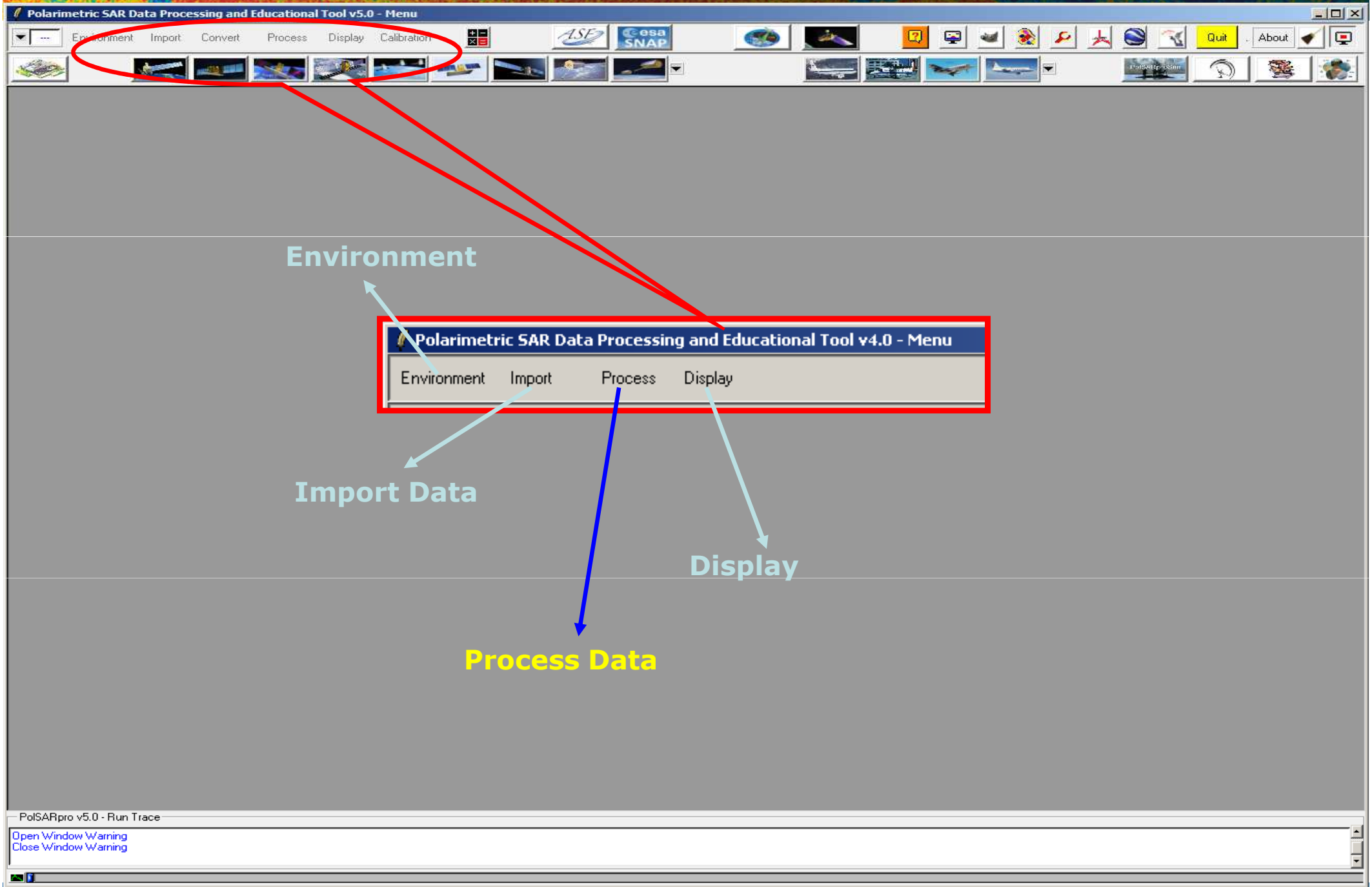
E. Pottier (2013)

PROCESSING CHAIN

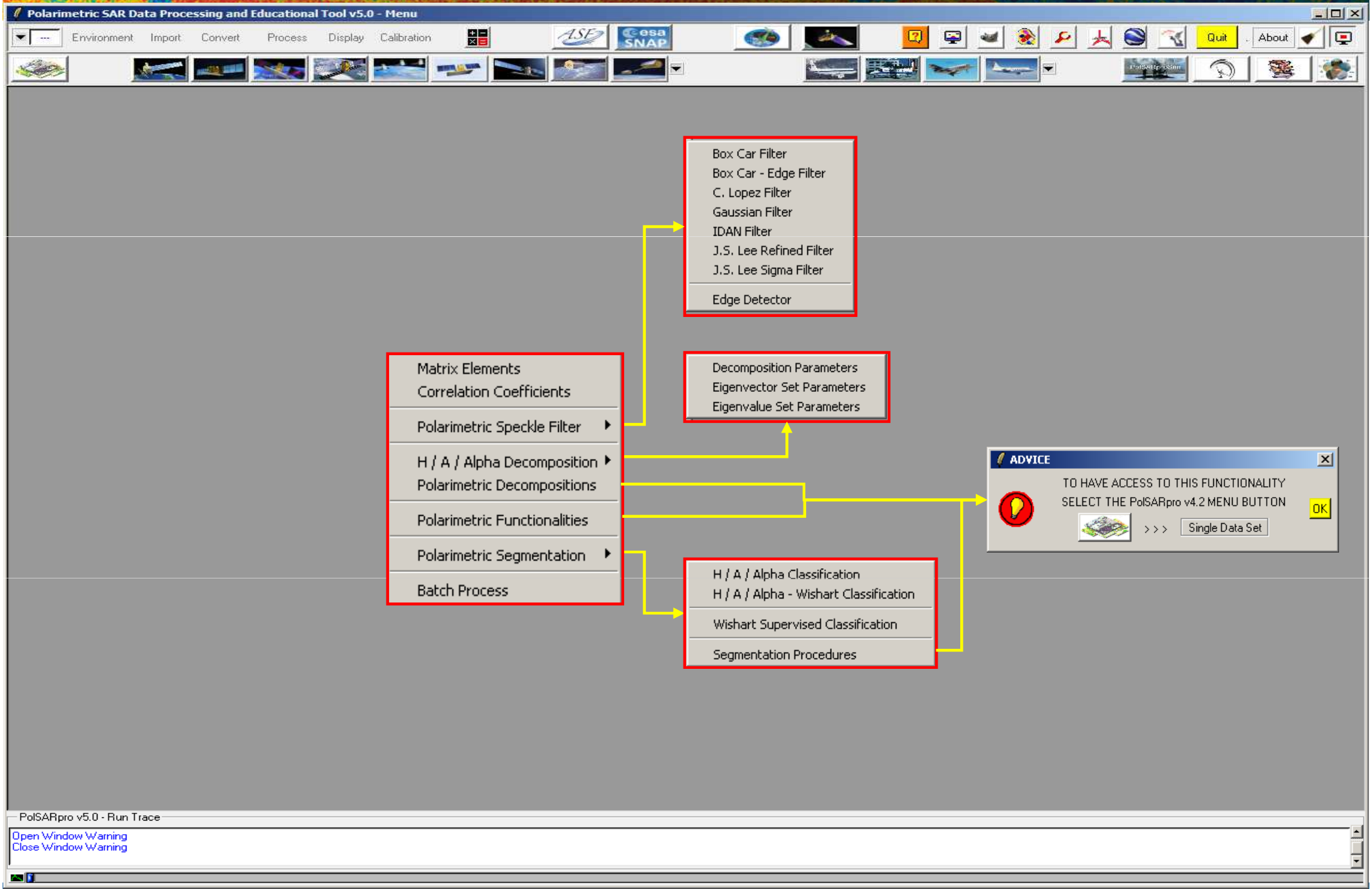


- Input Data File
- QuickLook
- Extract Raw Data
- [T3] Elements
- Speckle Filtering
  - Box Car
  - Gaussian
  - Lee Refined
- H / A / Alpha
  - Decomposition Parameters
  - Eigenvectors Parameters
  - Eigenvalues Parameters
- Polarimetric Segmentation
  - H / A / alpha Segmentation
  - Unsupervised Wishart H / A / alpha Segmentation
  - Supervised Wishart H / A / alpha Segmentation
- Batch Process
  - Speckle Filtering
  - H / A / alpha Decomposition
  - Unsupervised Wishart H / A / alpha Segmentation
- BMP 8 / 24 bits
- RGB

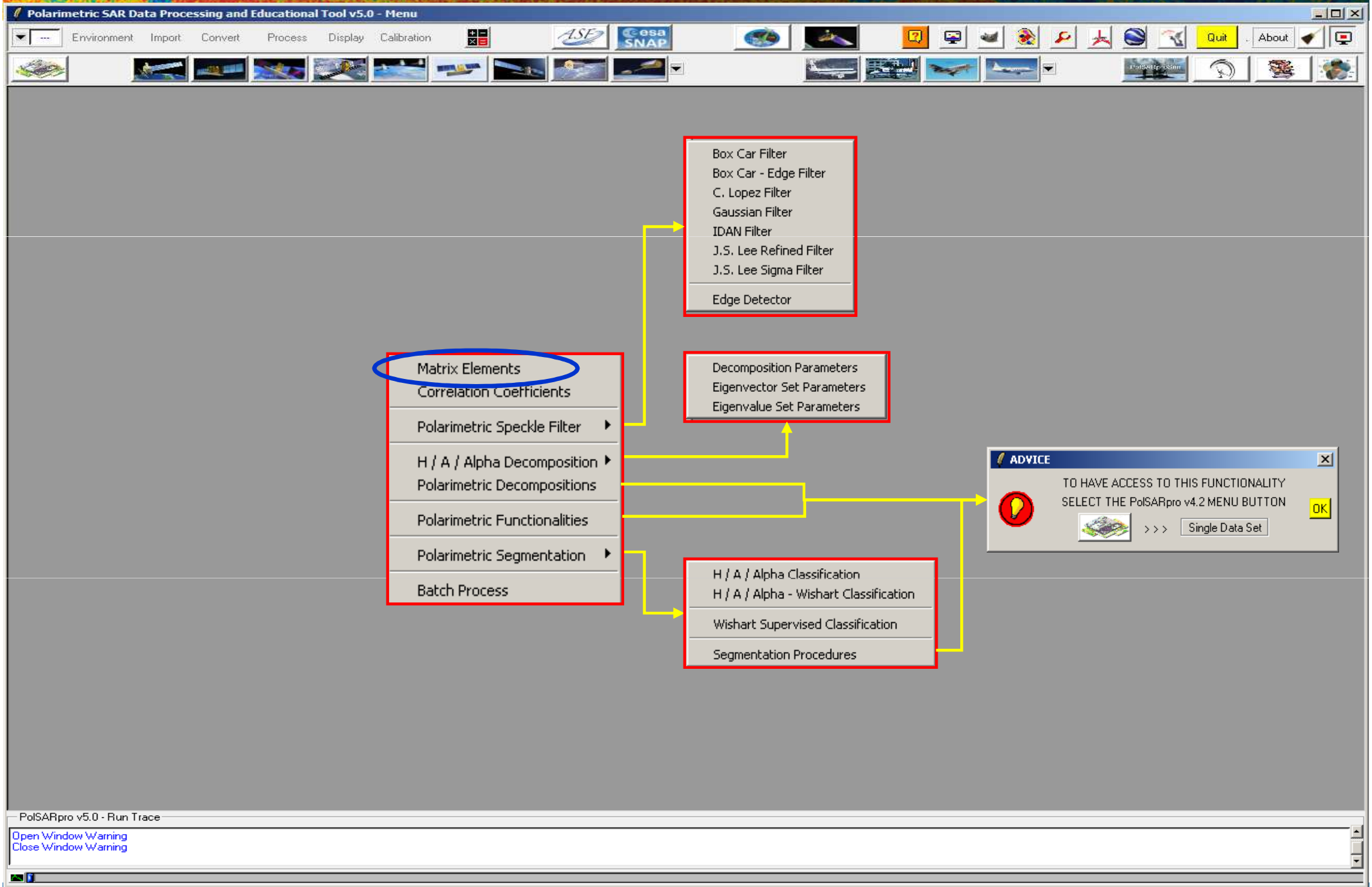
PROCESS DATA



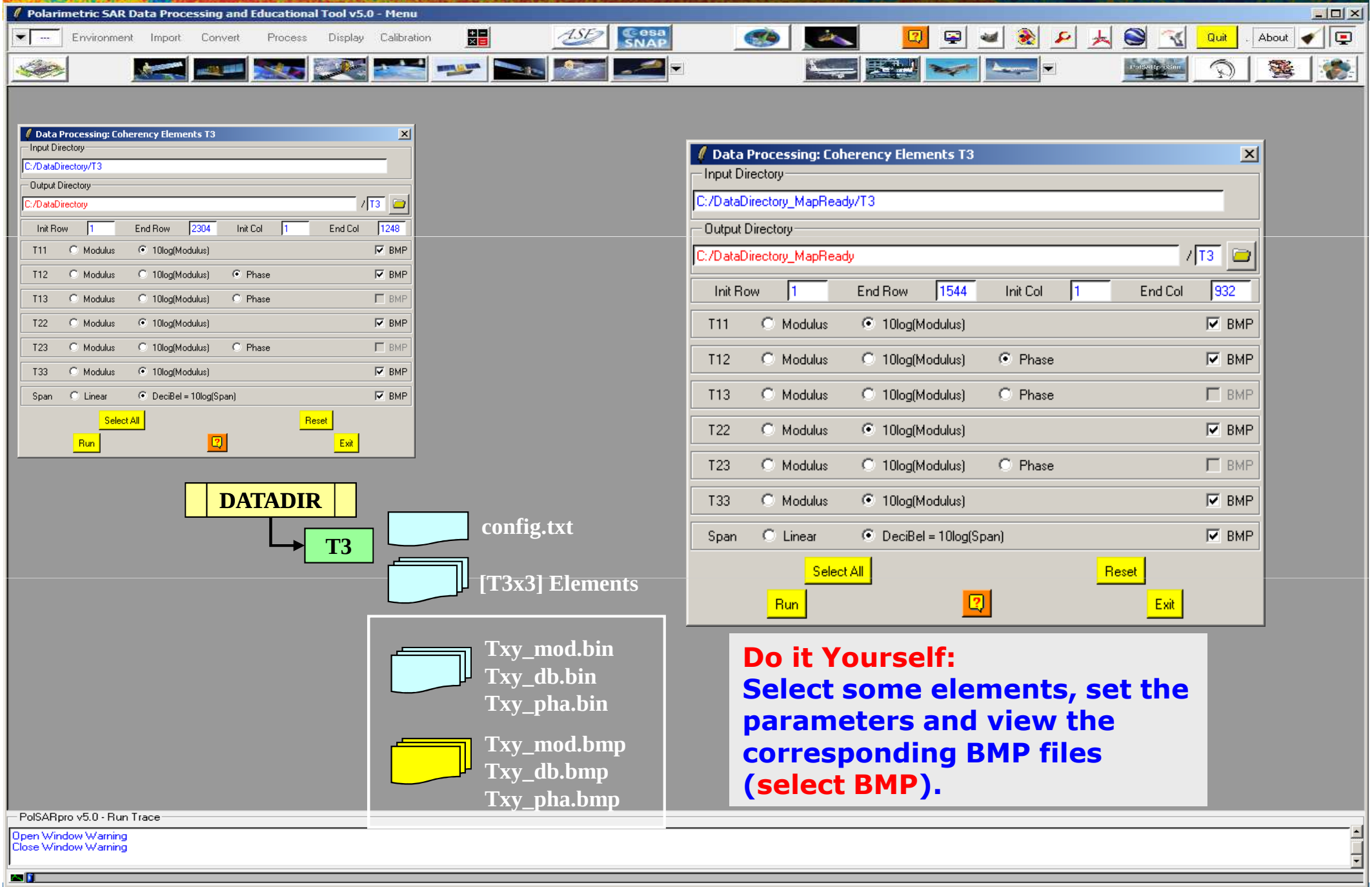
PROCESS DATA



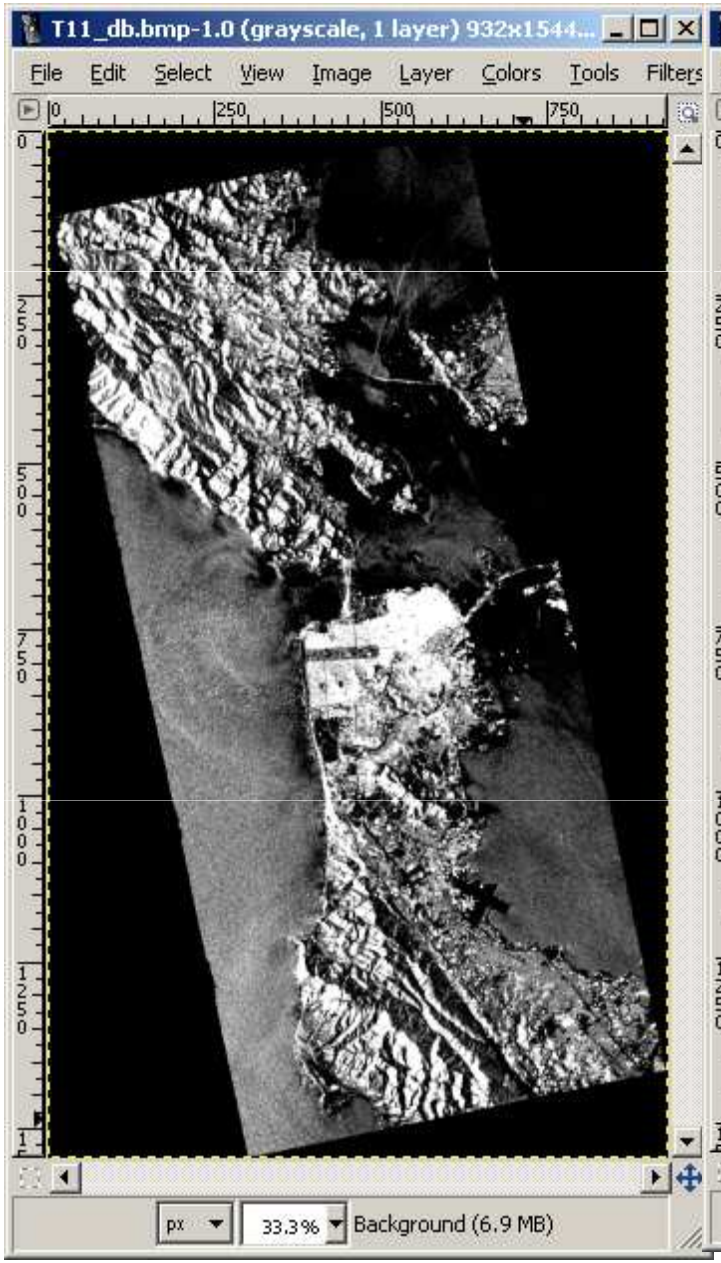
PROCESS DATA



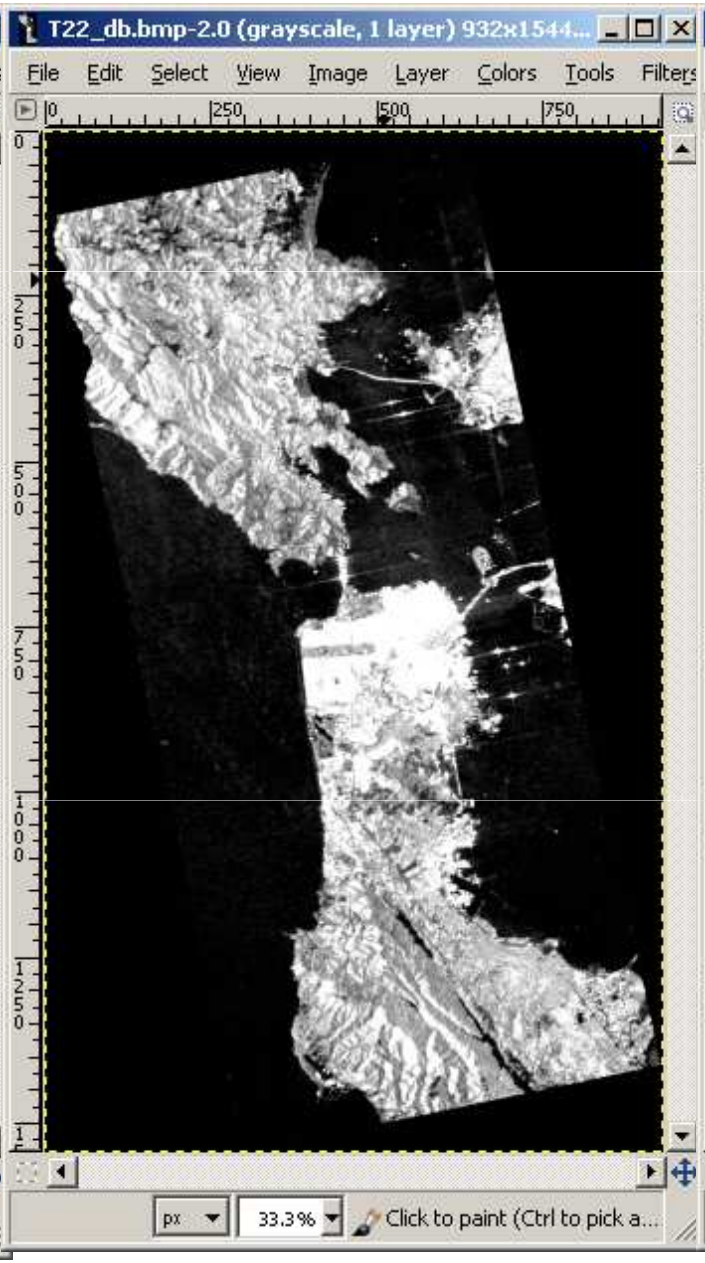
[T3] ELEMENTS


Polarimetric SAR Data Processing and Educational Tool v5.0 - Menu
Environment
Import
Convert
Process
Display
Calibration
Quit
About
Data Processing: Coherency Elements T3
Input Directory
C:/DataDirectory/T3
Output Directory
C:/DataDirectory
/T3
Init Row 1 End Row 2304 Init Col 1 End Col 1248
T11 Modulus 10log(Modulus) BMP
T12 Modulus 10log(Modulus) Phase BMP
T13 Modulus 10log(Modulus) Phase BMP
T22 Modulus 10log(Modulus) BMP
T23 Modulus 10log(Modulus) Phase BMP
T33 Modulus 10log(Modulus) BMP
Span Linear DeciBel = 10log(Span) BMP
Select All
Reset
Run
Exit
DATADIR
T3
config.txt
[T3x3] Elements
Txy_mod.bin
Txy_db.bin
Txy_pha.bin
Txy_mod.bmp
Txy_db.bmp
Txy_pha.bmp
Data Processing: Coherency Elements T3
Input Directory
C:/DataDirectory_MapReady/T3
Output Directory
C:/DataDirectory_MapReady
/T3
Init Row 1 End Row 1544 Init Col 1 End Col 932
T11 Modulus 10log(Modulus) BMP
T12 Modulus 10log(Modulus) Phase BMP
T13 Modulus 10log(Modulus) Phase BMP
T22 Modulus 10log(Modulus) BMP
T23 Modulus 10log(Modulus) Phase BMP
T33 Modulus 10log(Modulus) BMP
Span Linear DeciBel = 10log(Span) BMP
Select All
Reset
Run
Exit
Do it Yourself:
Select some elements, set the parameters and view the corresponding BMP files (select BMP).
PolSARpro v5.0 - Run Trace
Open Window Warning
Close Window Warning

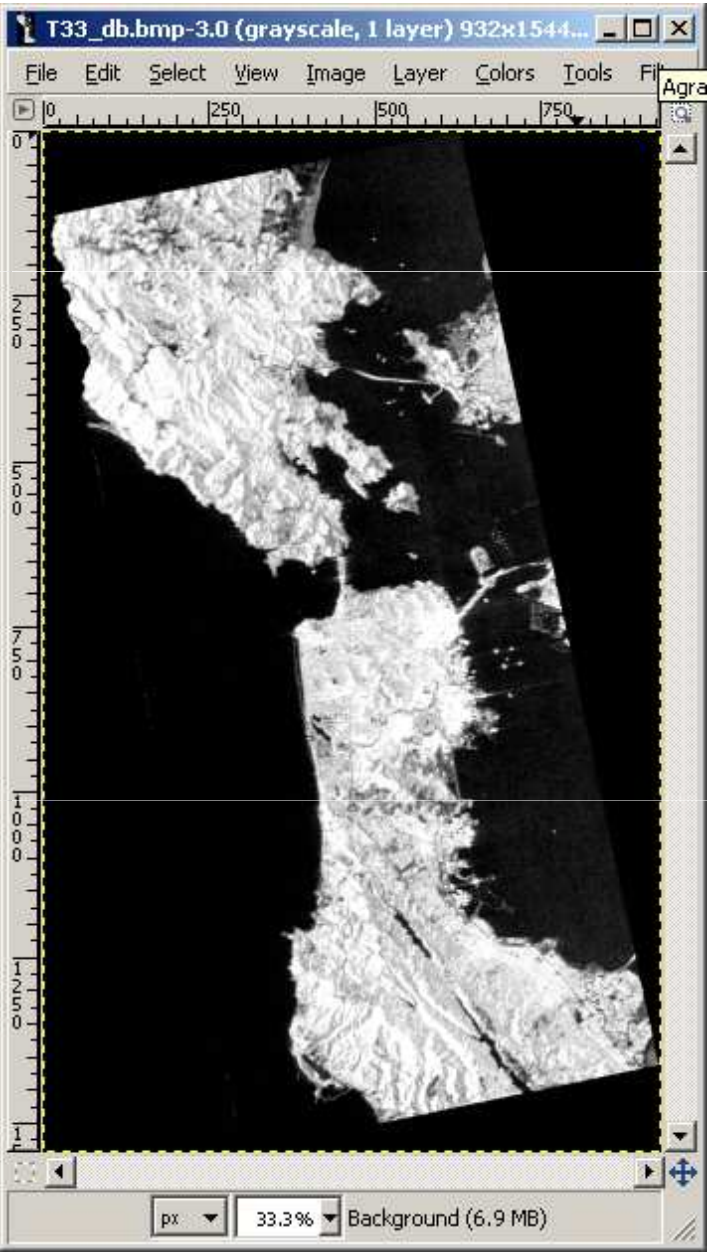
T11_dB



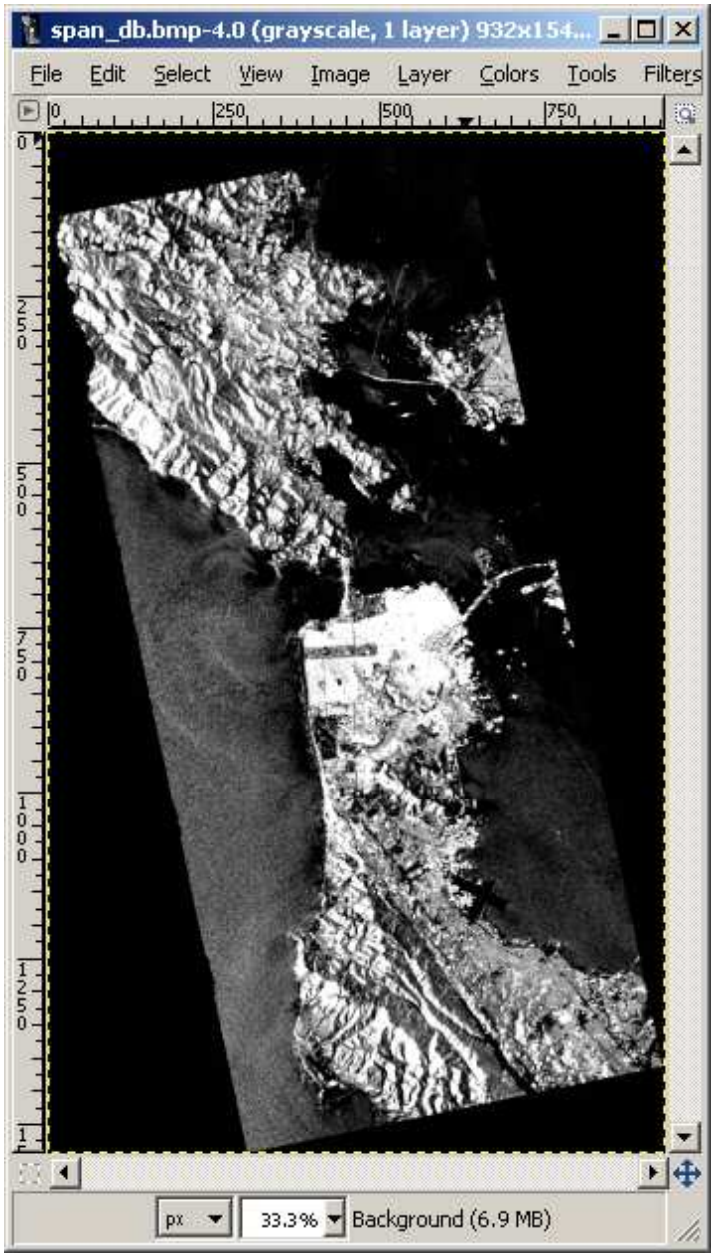
T22_dB



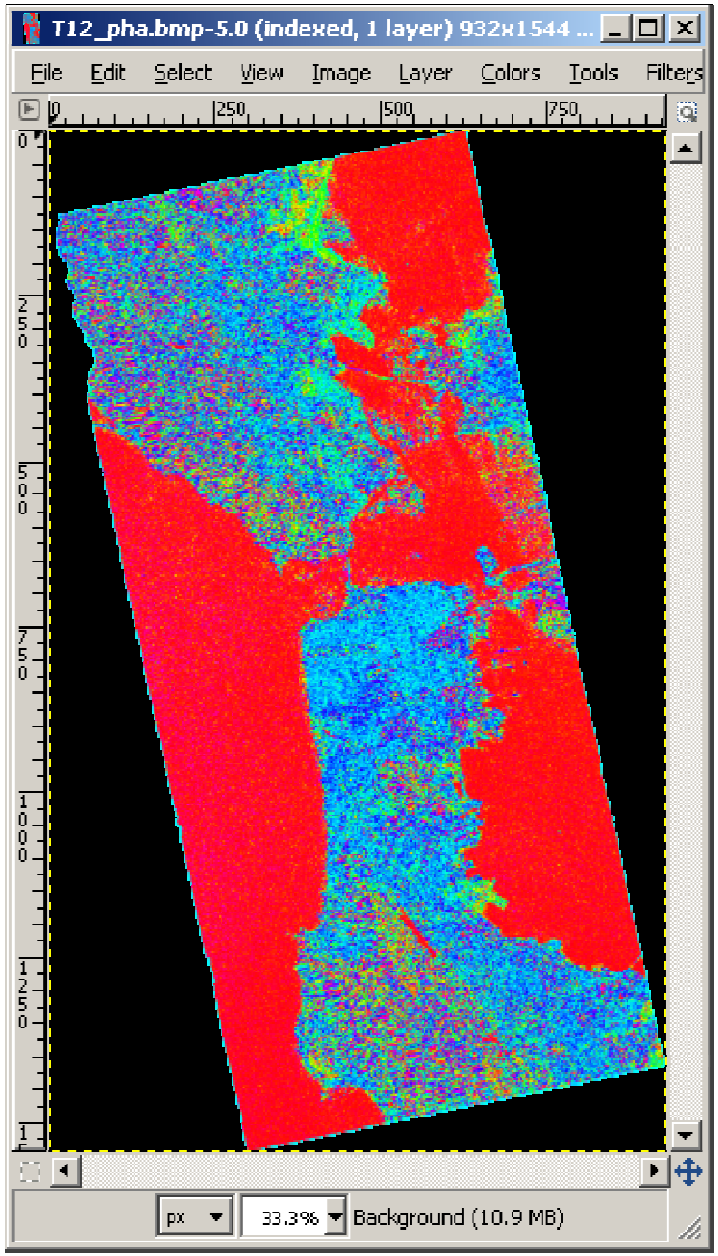
T33_dB



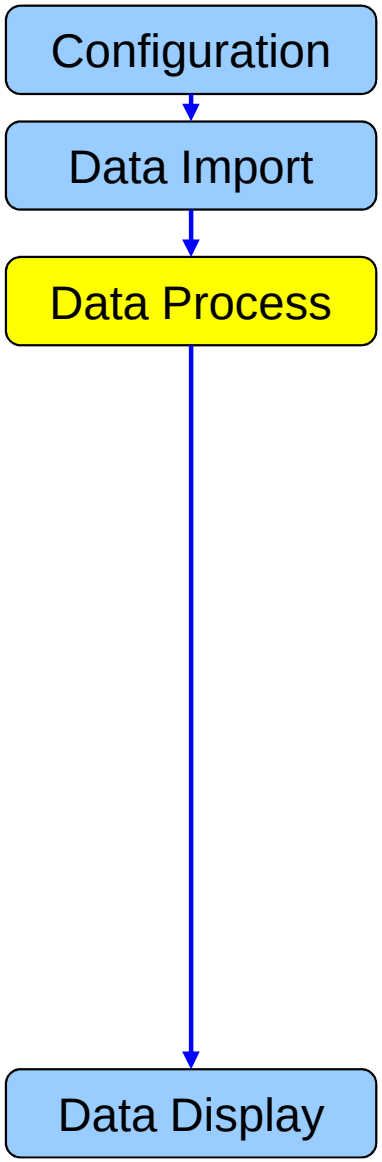
span_dB



T12_pha



PROCESSING CHAIN

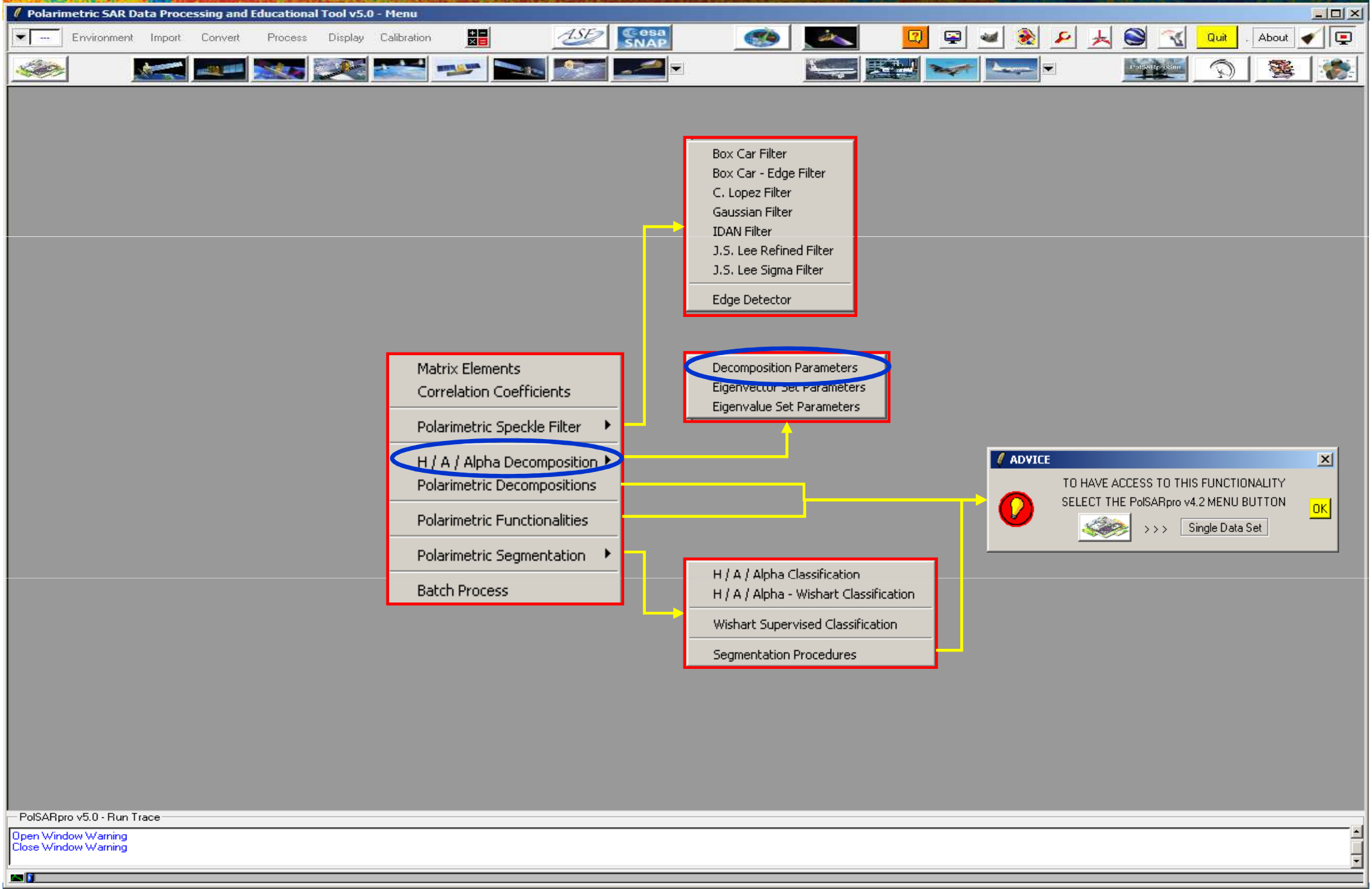


- Input Data File
- QuickLook
- Extract Raw Data

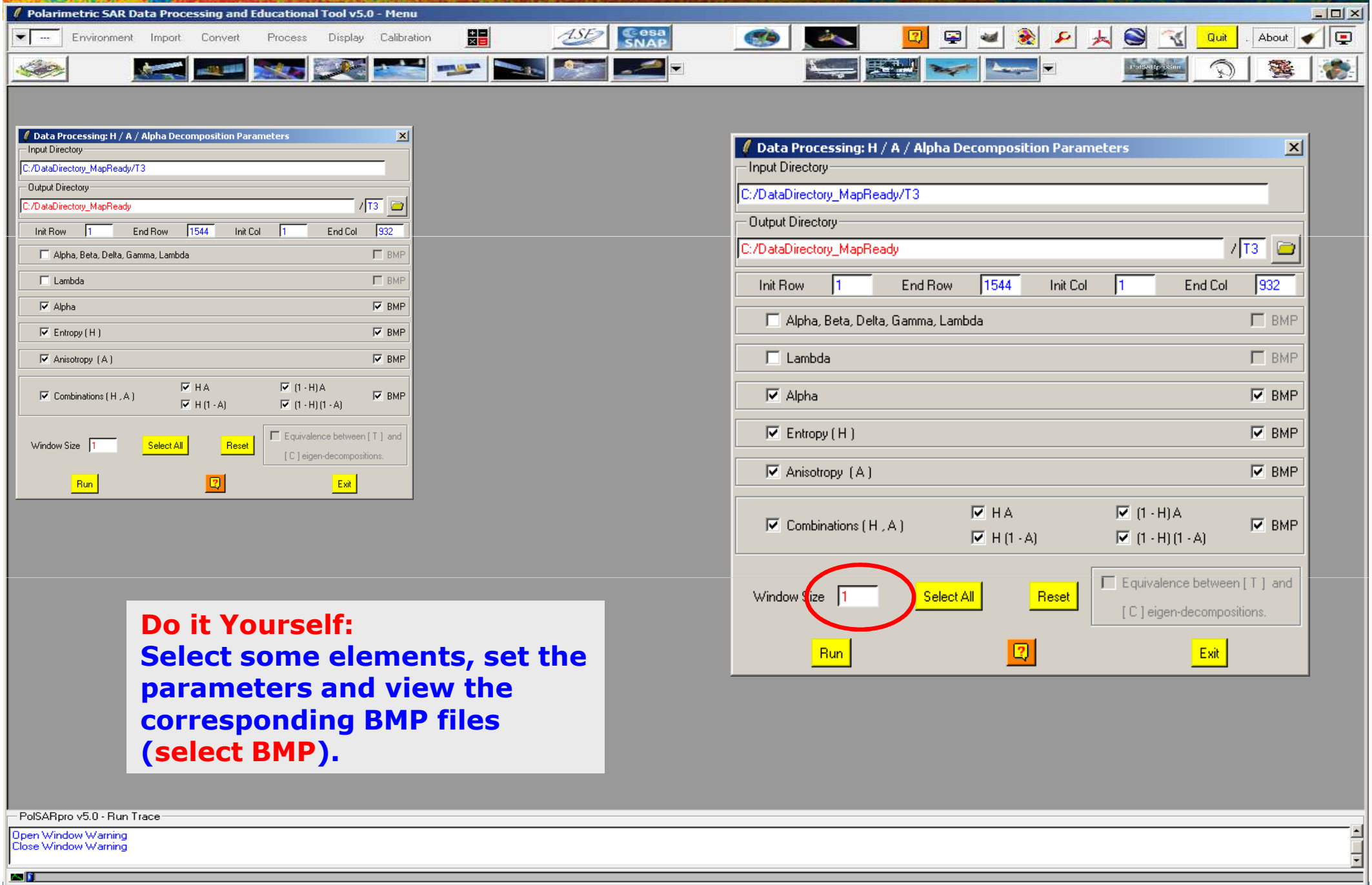
- [T3] Elements
- Speckle Filtering
  - Box Car
  - Gaussian
  - Lee Refined
- H / A / Alpha
  - Decomposition Parameters
  - Eigenvectors Parameters
  - Eigenvalues Parameters
- Polarimetric Segmentation
  - H / A / alpha Segmentation
  - Unsupervised Wishart H / A / alpha Segmentation
  - Supervised Wishart H / A / alpha Segmentation
- Batch Process
  - Speckle Filtering
  - H / A / alpha Decomposition
  - Unsupervised Wishart H / A / alpha Segmentation

- BMP 8 / 24 bits
- RGB

PROCESS DATA



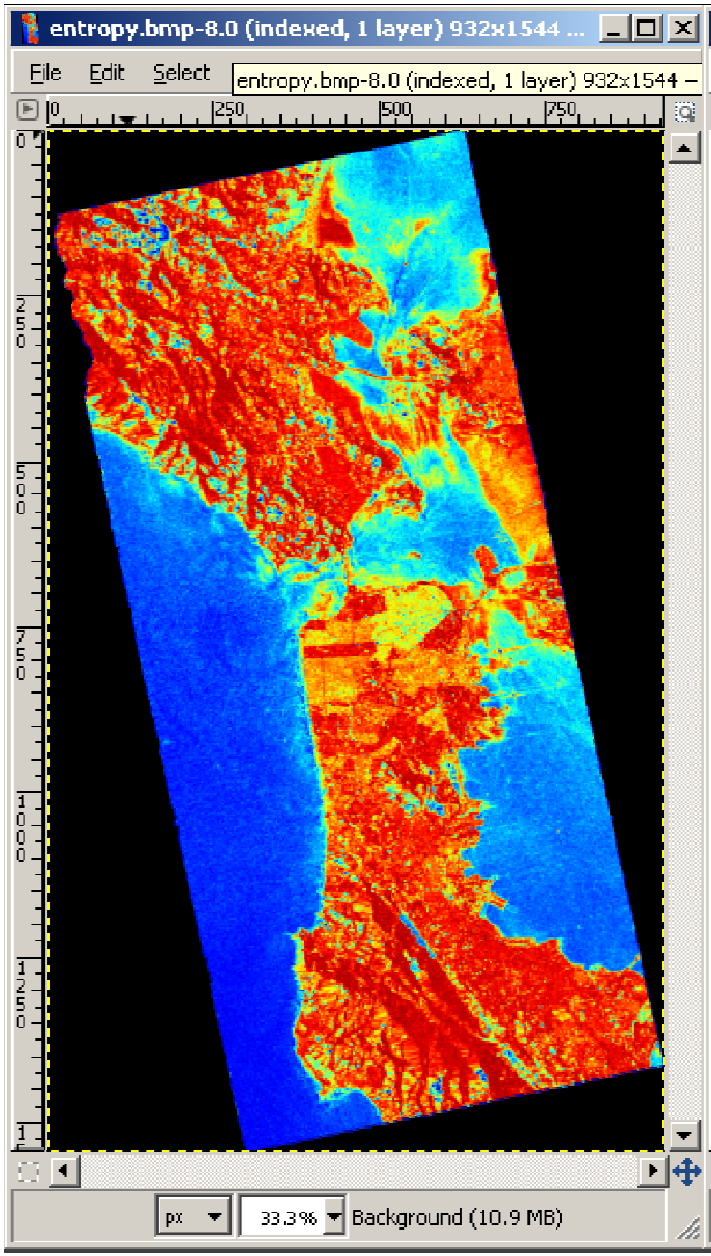
DECOMPOSITION PARAMETERS



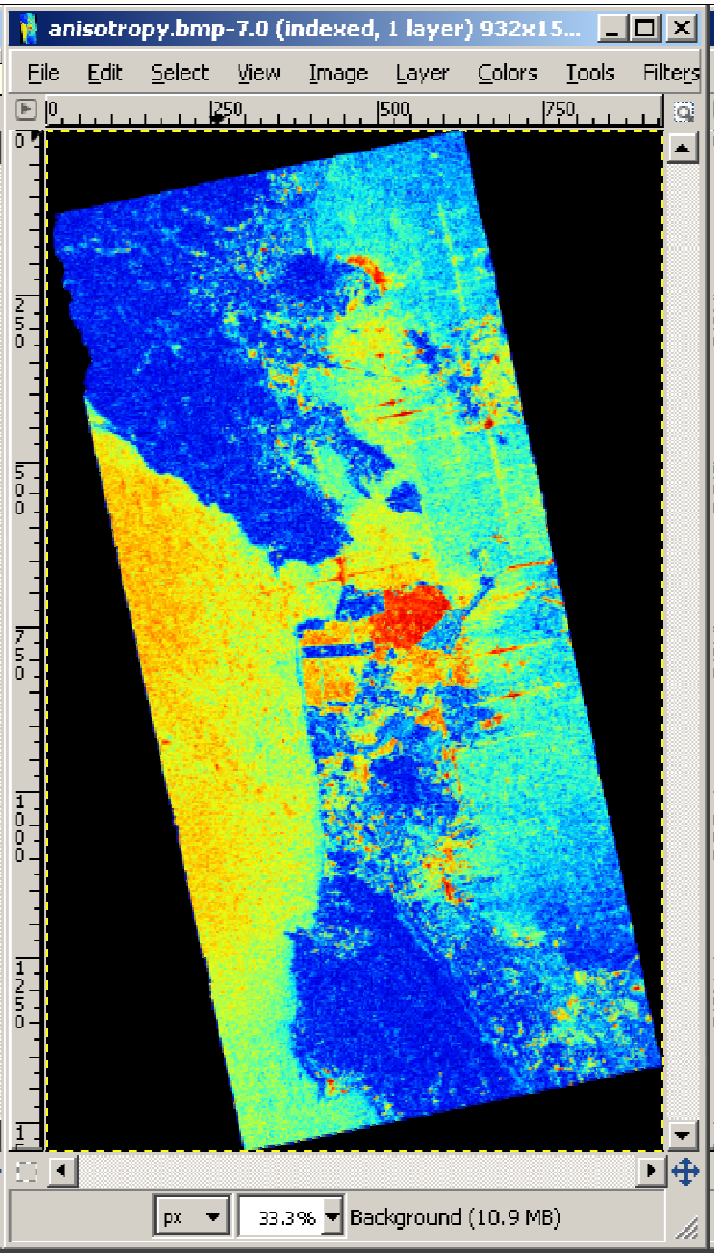
Do it Yourself:
Select some elements, set the parameters and view the corresponding BMP files (select BMP).

DECOMPOSITION PARAMETERS

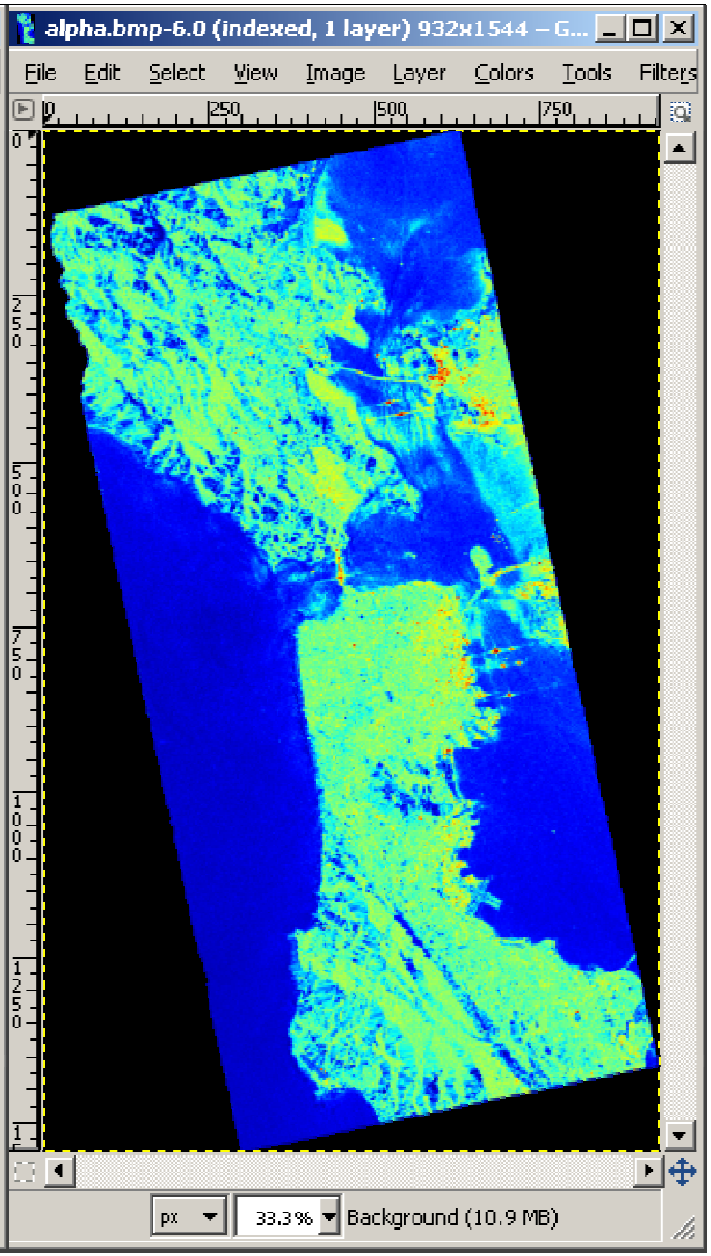
Entropy



Anisotropy

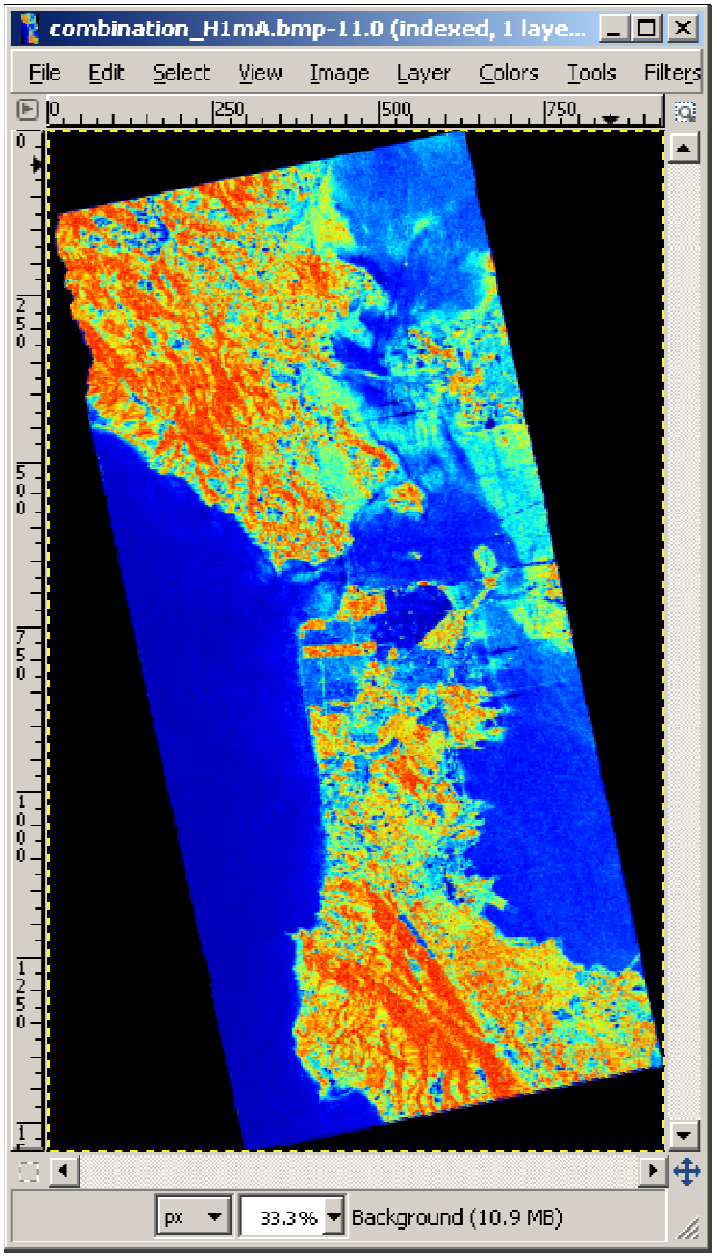


Alpha

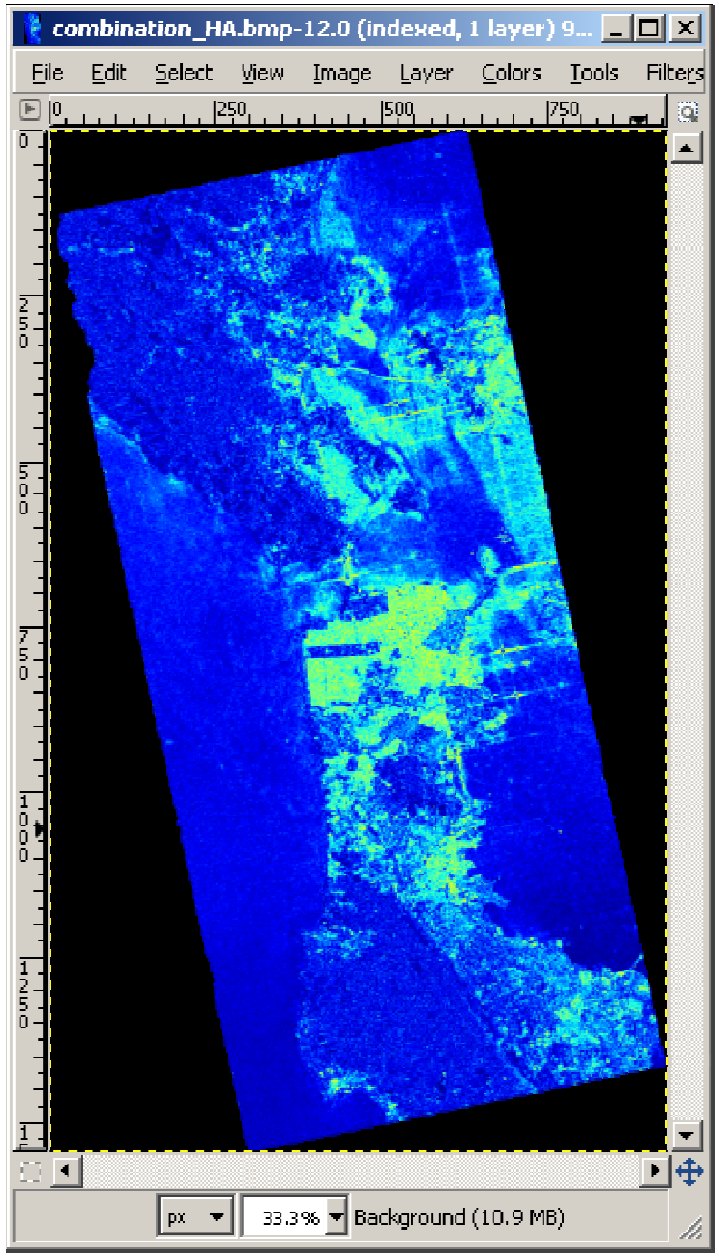


DECOMPOSITION PARAMETERS

H (1-A)

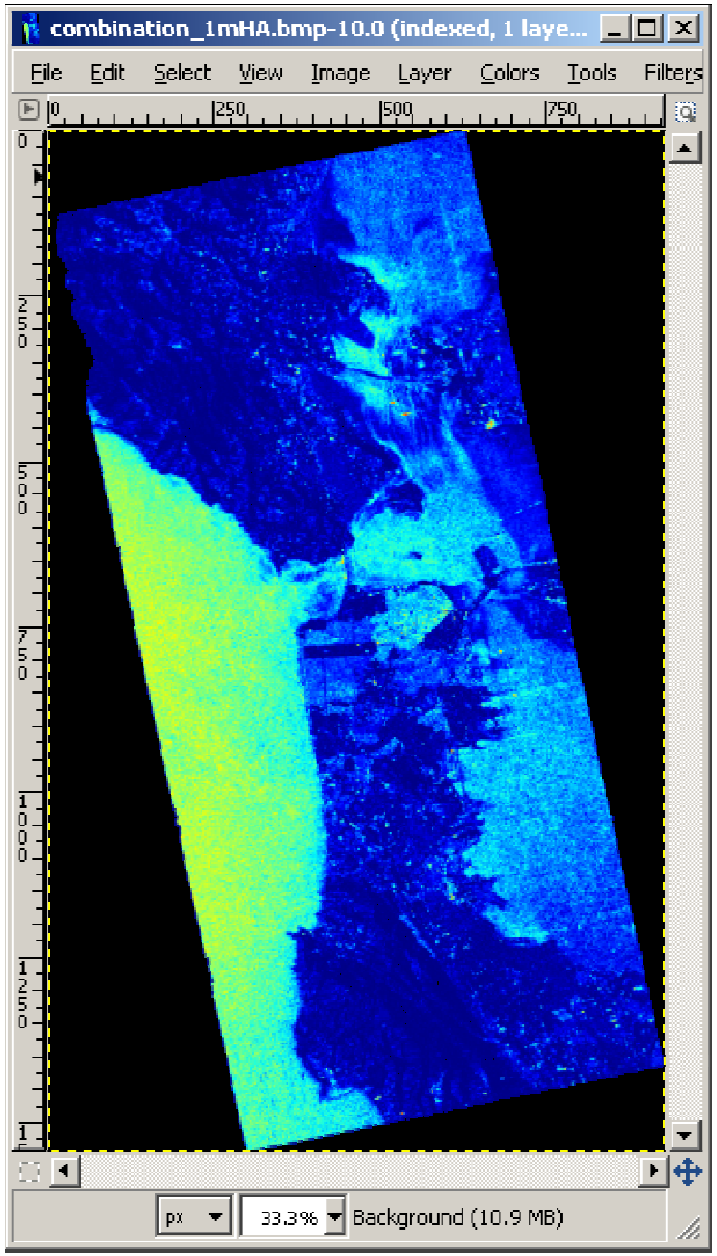


HA

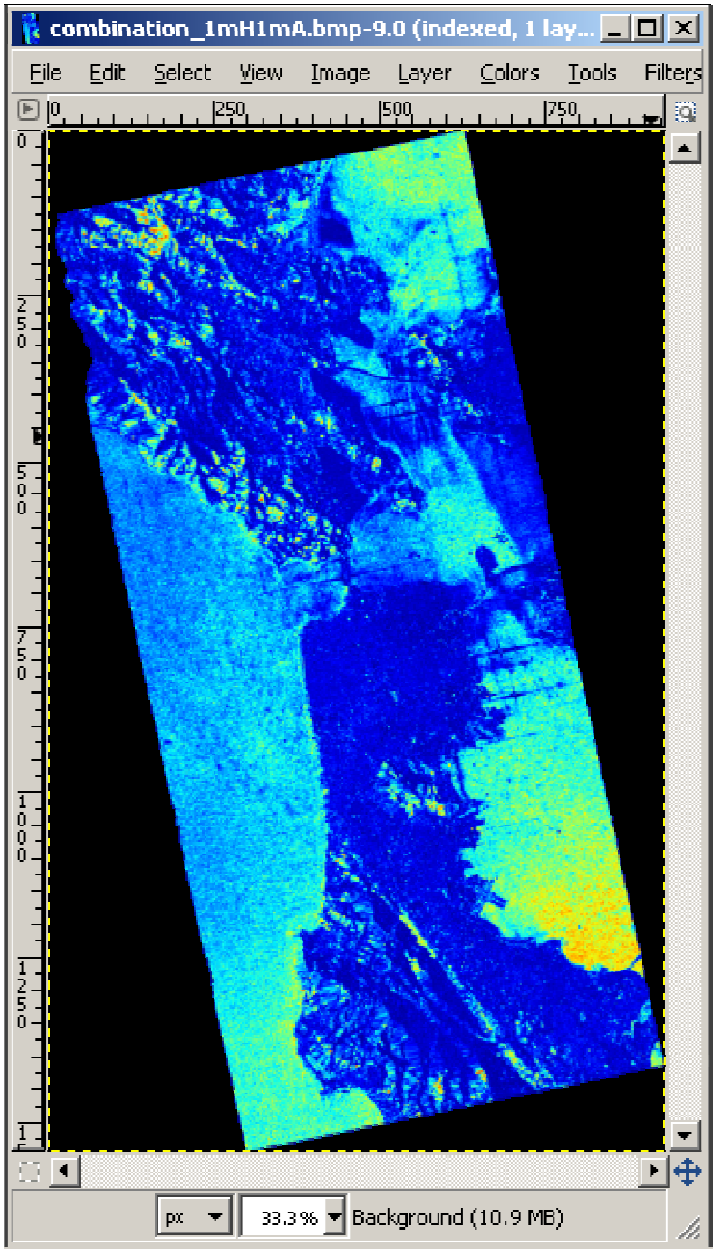


DECOMPOSITION PARAMETERS

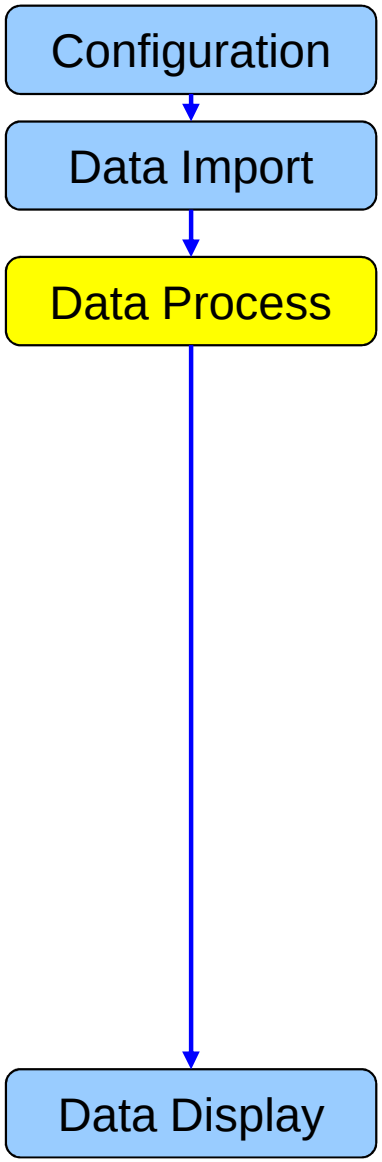
(1–H) A



(1-H) (1-A)



PROCESSING CHAIN

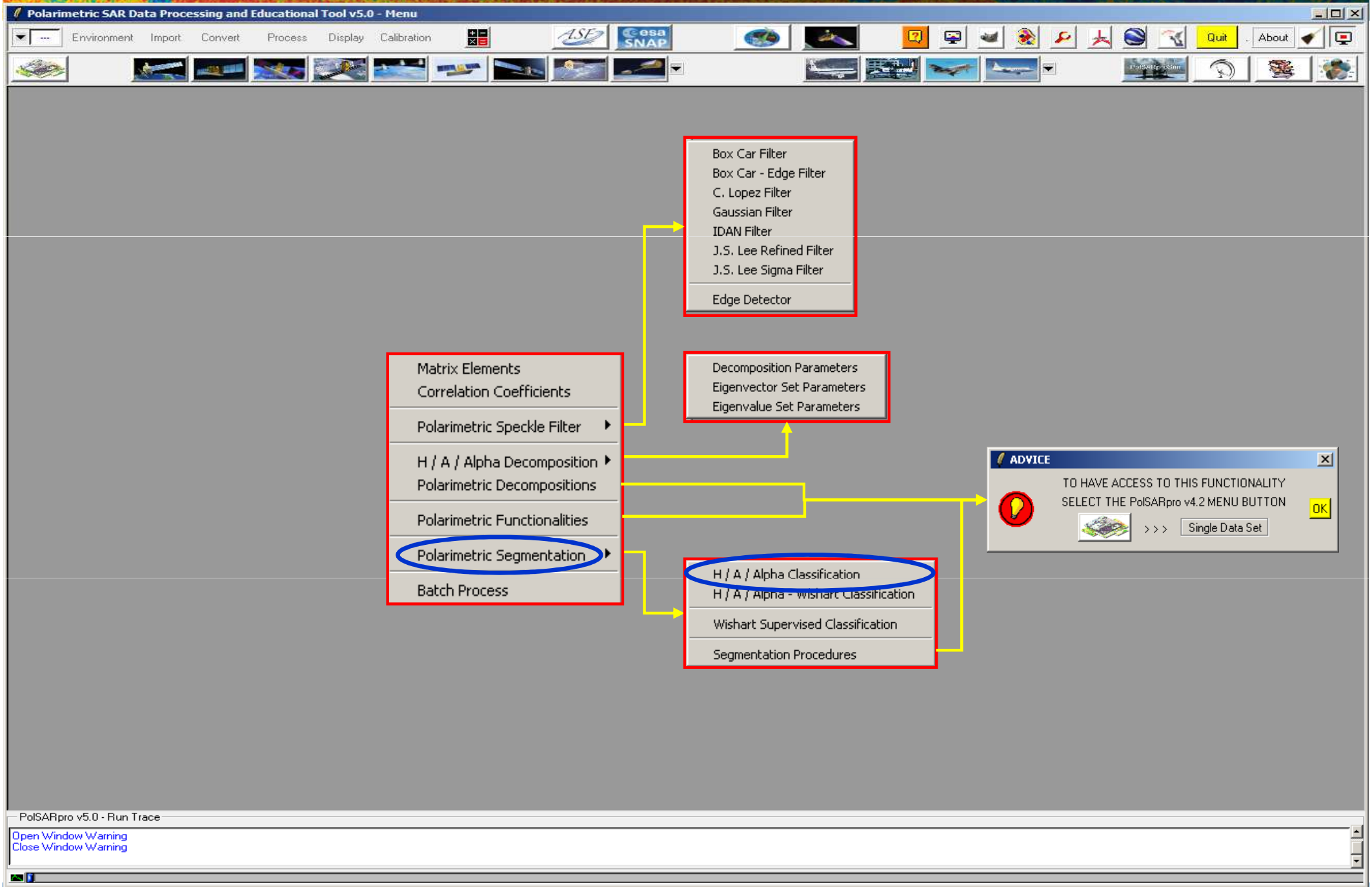


- Input Data File
- QuickLook
- Extract Raw Data

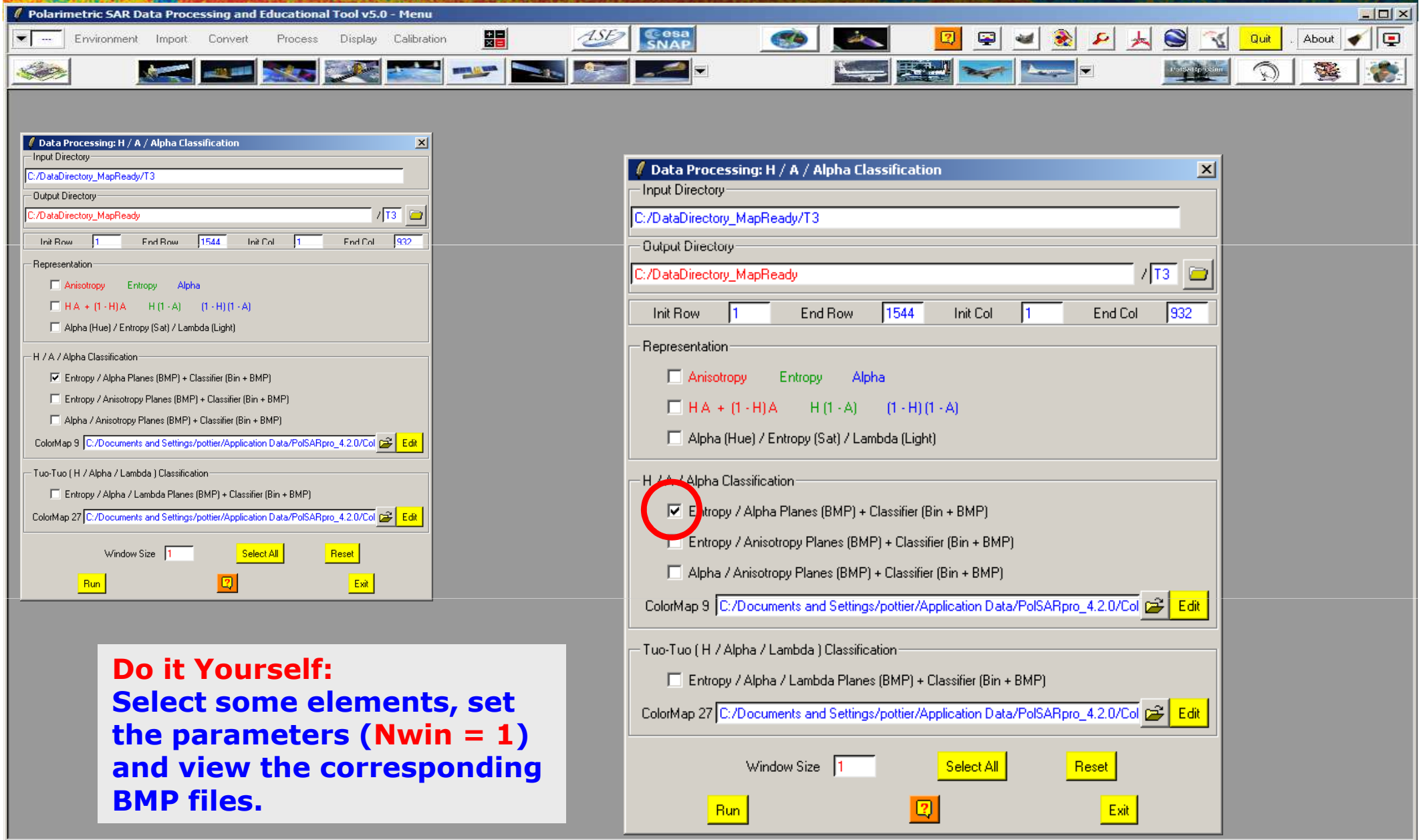
- [T3] Elements
- Speckle Filtering
  - Box Car
  - Gaussian
  - Lee Refined
- H / A / Alpha
  - Decomposition Parameters
  - Eigenvectors Parameters
  - Eigenvalues Parameters
- Polarimetric Segmentation
  - H / A / alpha Segmentation
  - Unsupervised Wishart H / A / alpha Segmentation
  - Supervised Wishart H / A / alpha Segmentation
- Batch Process
  - Speckle Filtering
  - H / A / alpha Decomposition
  - Unsupervised Wishart H / A / alpha Segmentation

- BMP 8 / 24 bits
- RGB

PROCESS DATA

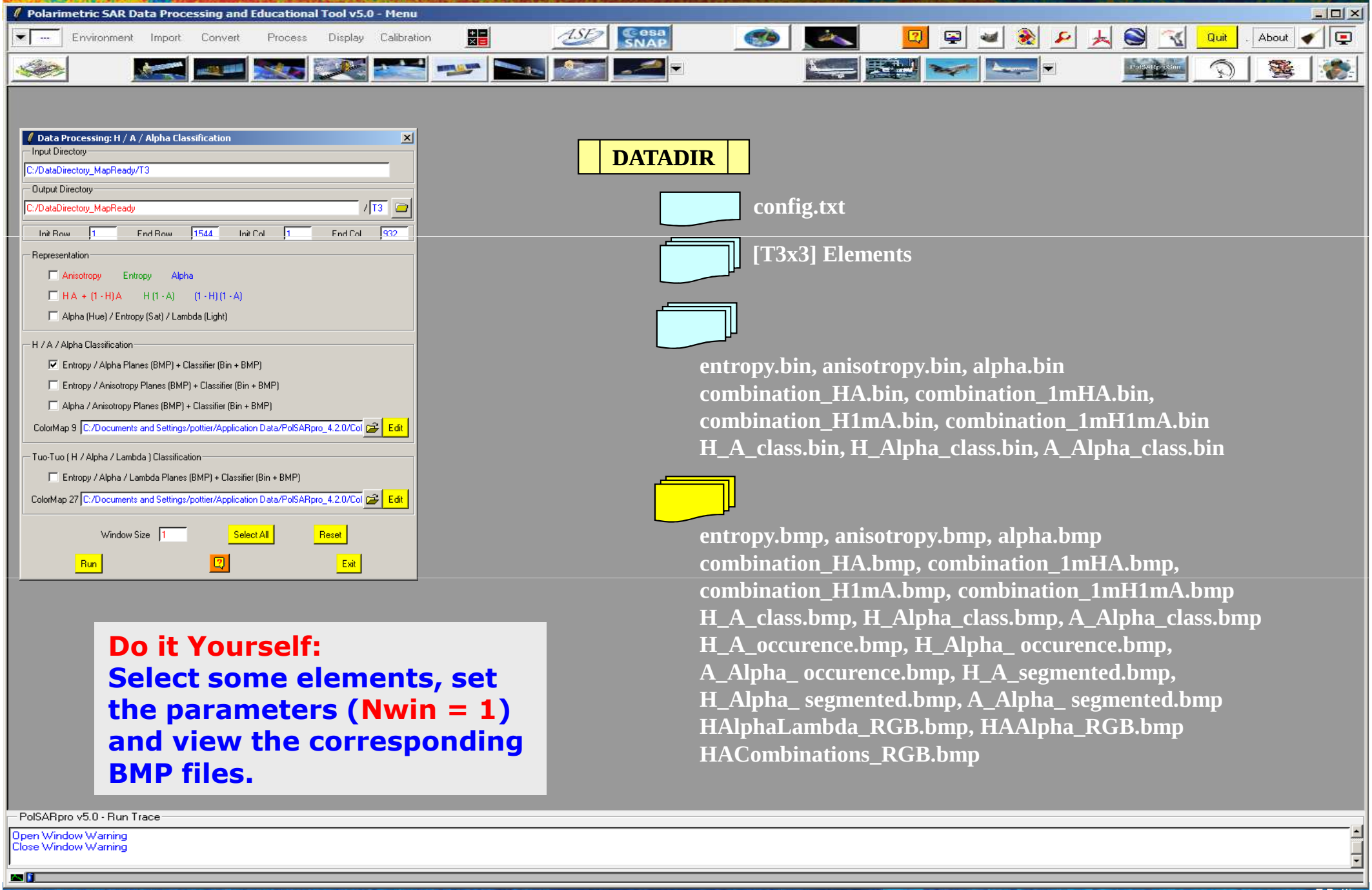


H / A / alpha CLASSIFICATION



Do it Yourself:
Select some elements, set the parameters (Nwin = 1) and view the corresponding BMP files.

H / A / alpha CLASSIFICATION



DATADIR

config.txt

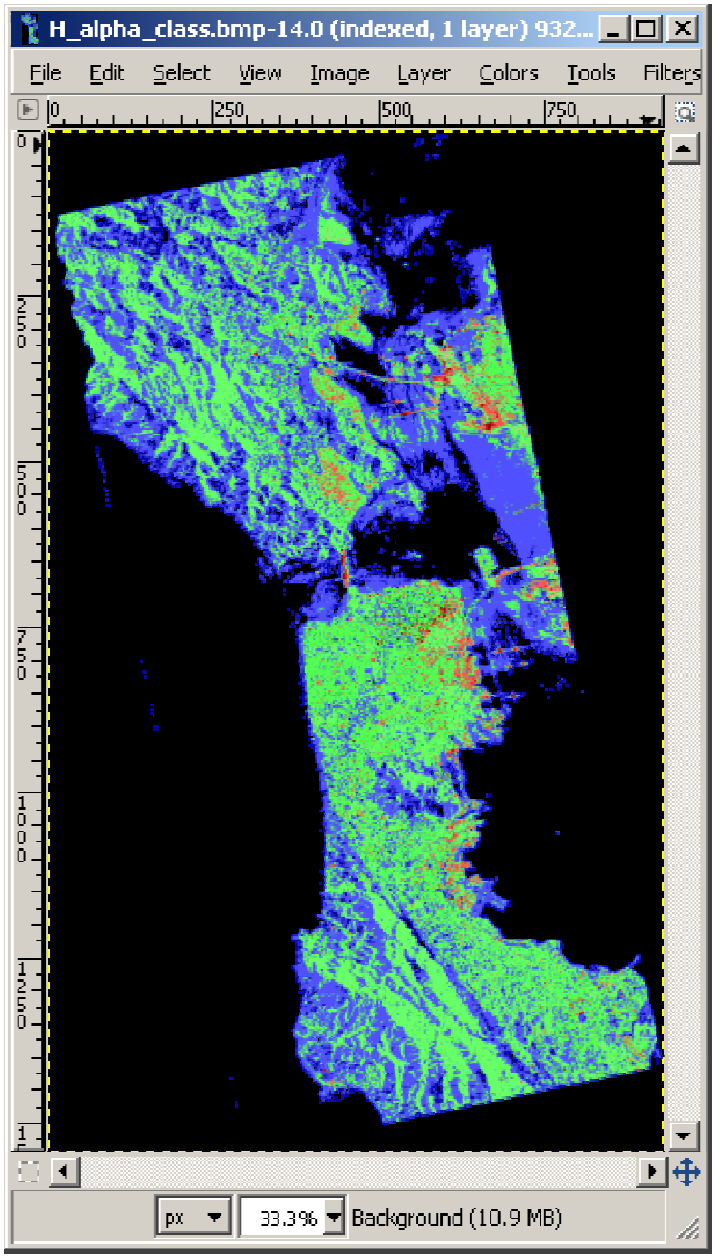
[T3x3] Elements

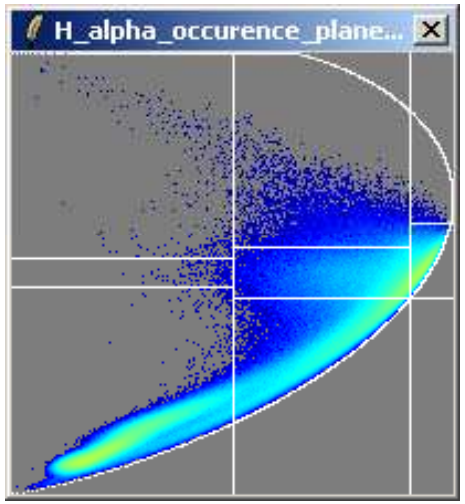
entropy.bin, anisotropy.bin, alpha.bin
combination_HA.bin, combination_1mHA.bin,
combination_H1mA.bin, combination_1mH1mA.bin
H_A_class.bin, H_Alpha_class.bin, A_Alpha_class.bin

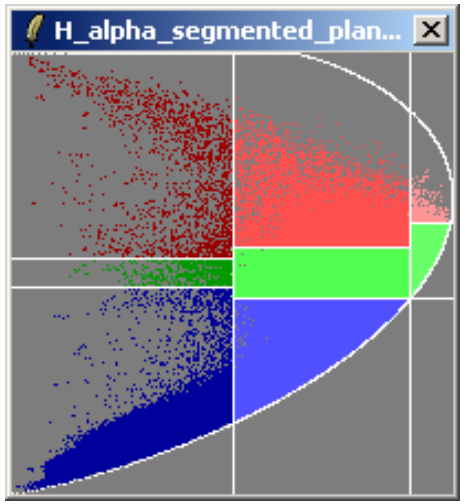
entropy.bmp, anisotropy.bmp, alpha.bmp
combination_HA.bmp, combination_1mHA.bmp,
combination_H1mA.bmp, combination_1mH1mA.bmp
H_A_class.bmp, H_Alpha_class.bmp, A_Alpha_class.bmp
H_A_occurence.bmp, H_Alpha_ occurence.bmp,
A_Alpha_ occurence.bmp, H_A_segmented.bmp,
H_Alpha_ segmented.bmp, A_Alpha_ segmented.bmp
HAlphaLambda_RGB.bmp, HAAlpha_RGB.bmp
HACombinations_RGB.bmp

Do it Yourself:
Select some elements, set the parameters (Nwin = 1) and view the corresponding BMP files.

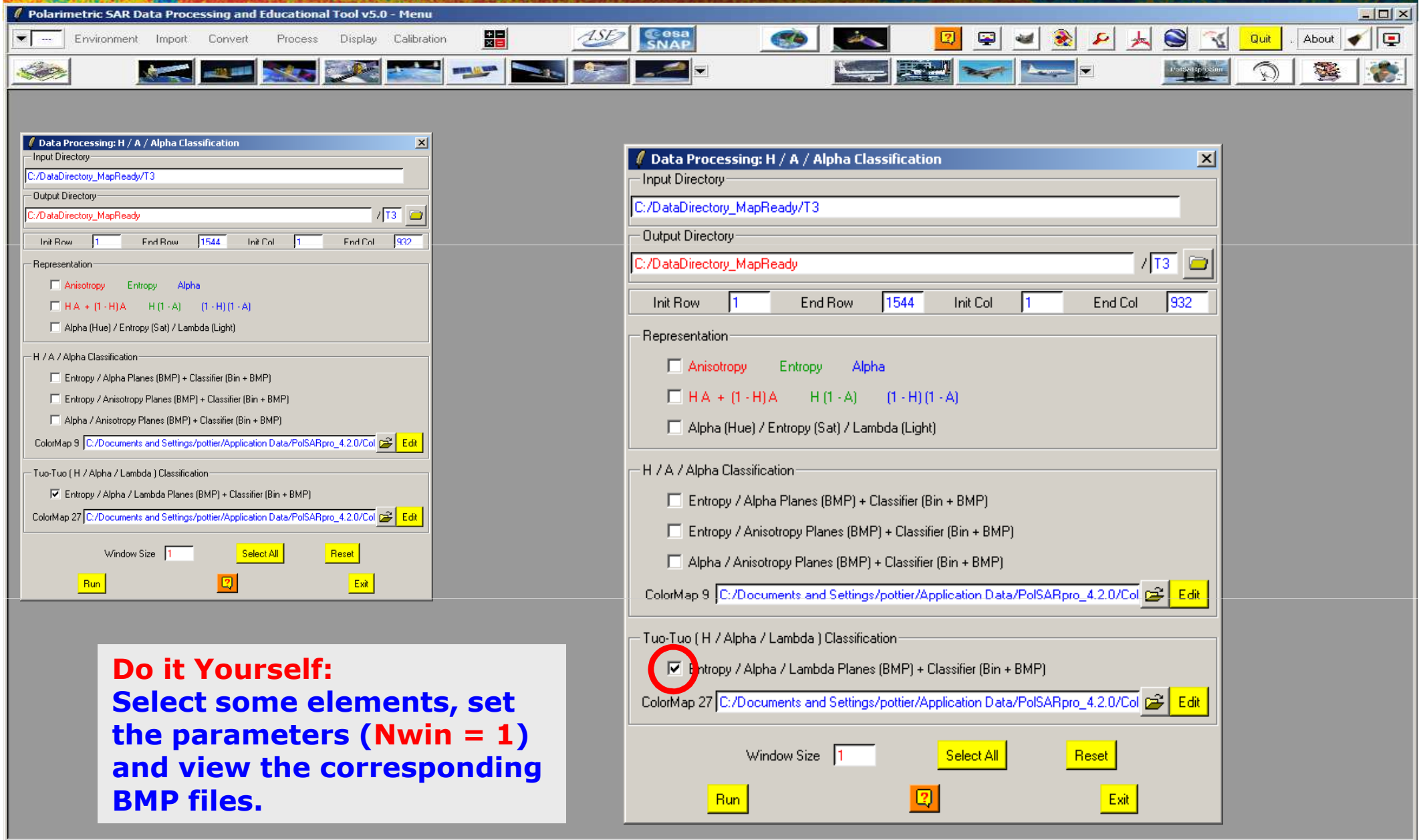
H / A / alpha CLASSIFICATION





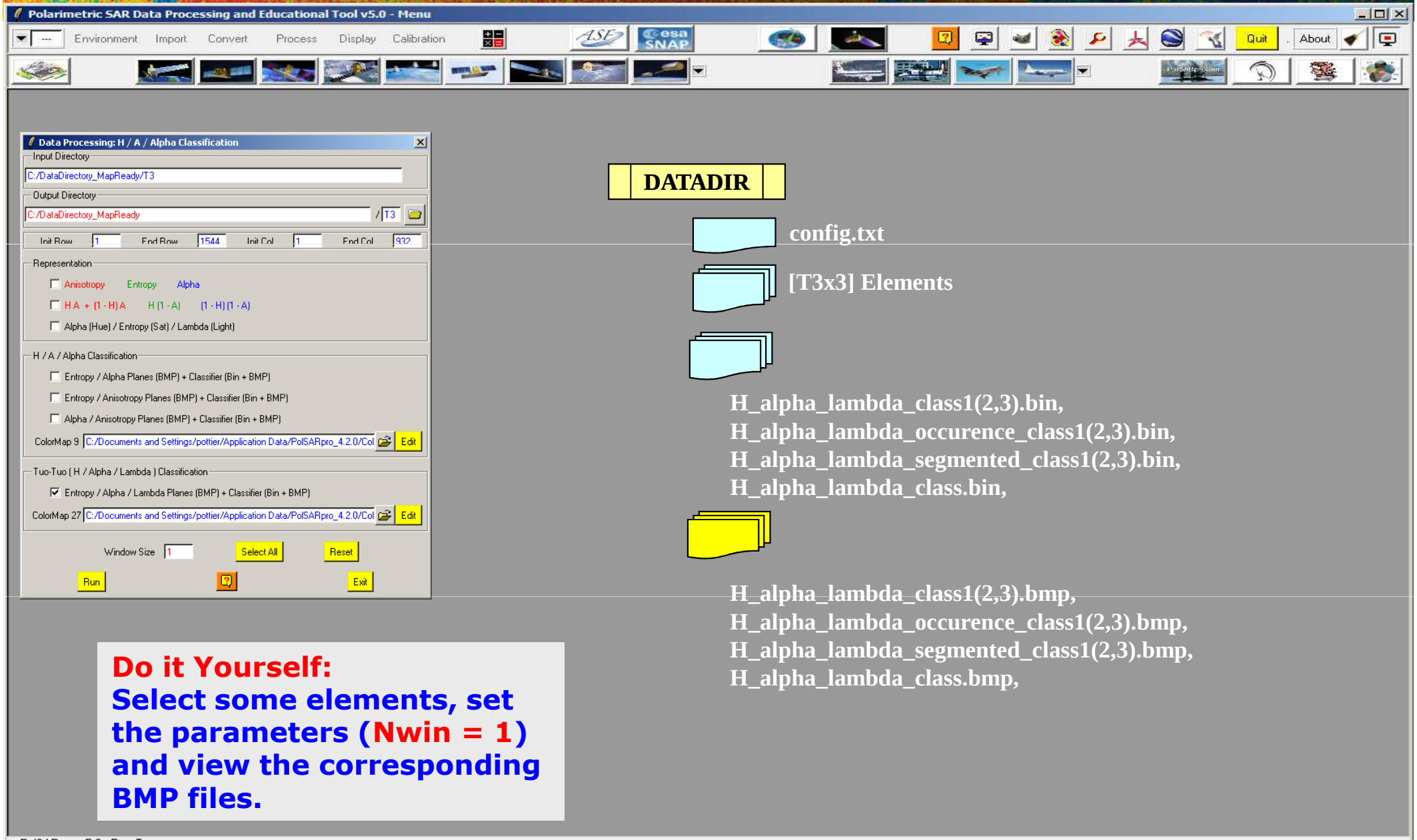


H / A / alpha CLASSIFICATION



Do it Yourself:
Select some elements, set the parameters (Nwin = 1) and view the corresponding BMP files.

H / A / alpha CLASSIFICATION



DATADIR

config.txt

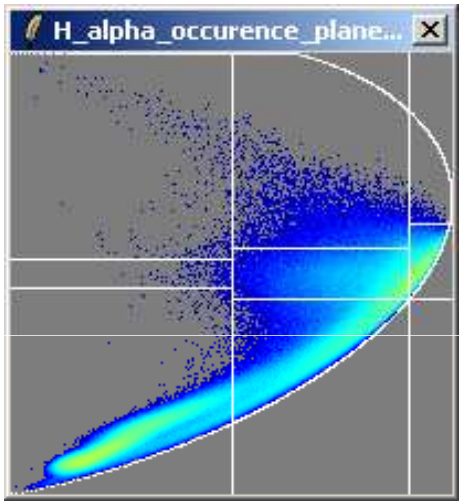
[T3x3] Elements

H_alpha_lambda_class1(2,3).bin,
H_alpha_lambda_occurence_class1(2,3).bin,
H_alpha_lambda_segmented_class1(2,3).bin,
H_alpha_lambda_class.bin,

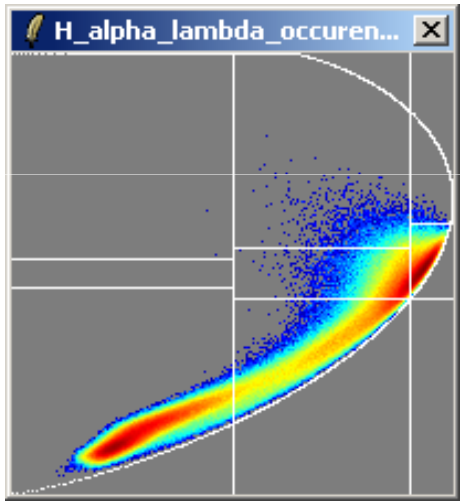
H_alpha_lambda_class1(2,3).bmp,
H_alpha_lambda_occurence_class1(2,3).bmp,
H_alpha_lambda_segmented_class1(2,3).bmp,
H_alpha_lambda_class.bmp,

Do it Yourself:
Select some elements, set the parameters (Nwin = 1) and view the corresponding BMP files.

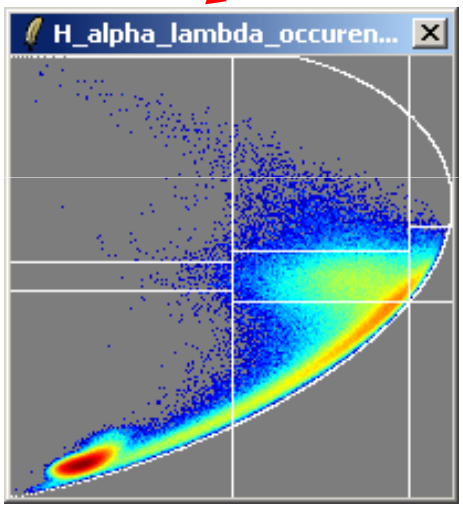
H / A / alpha CLASSIFICATION



Low λ

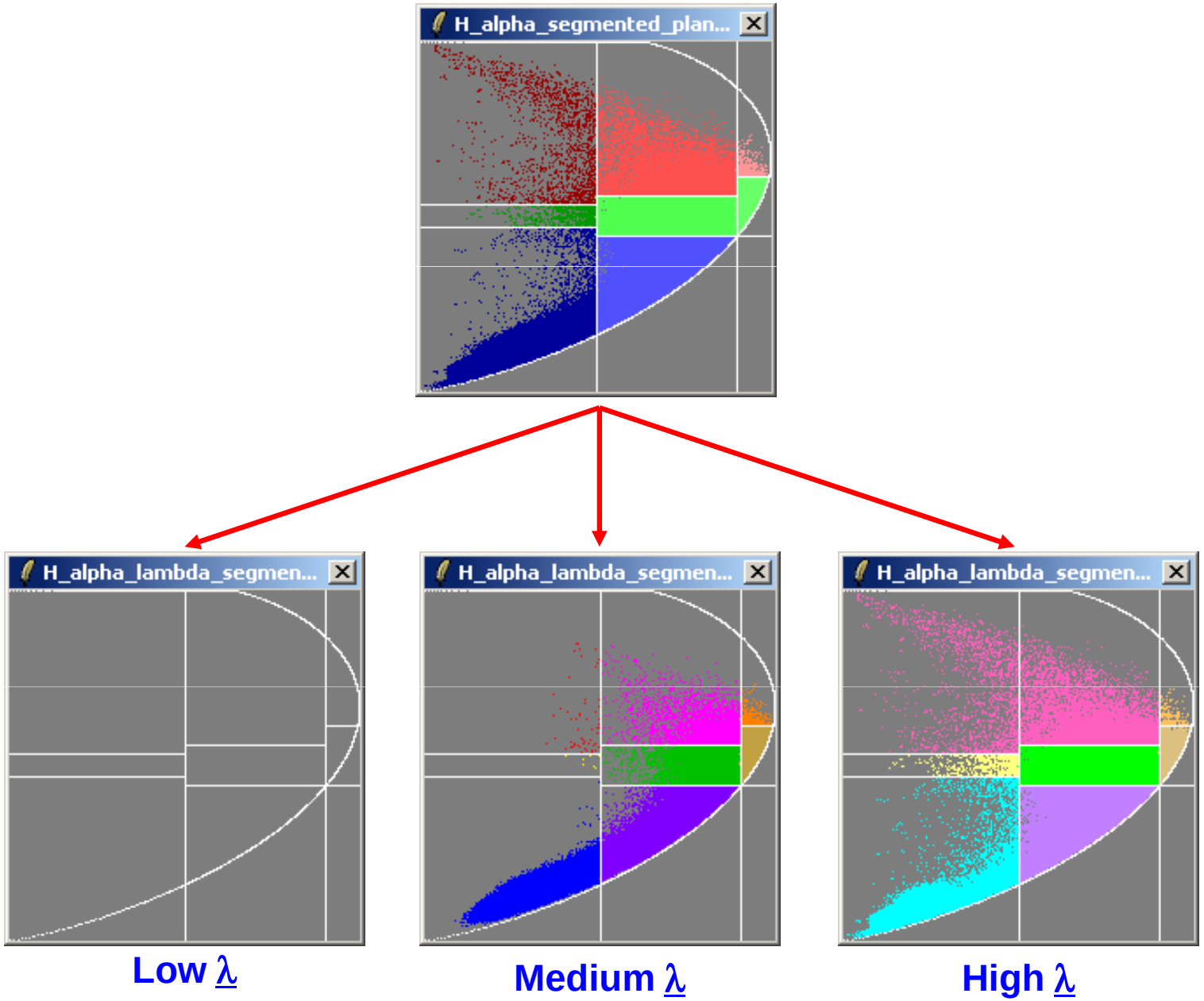


Medium λ

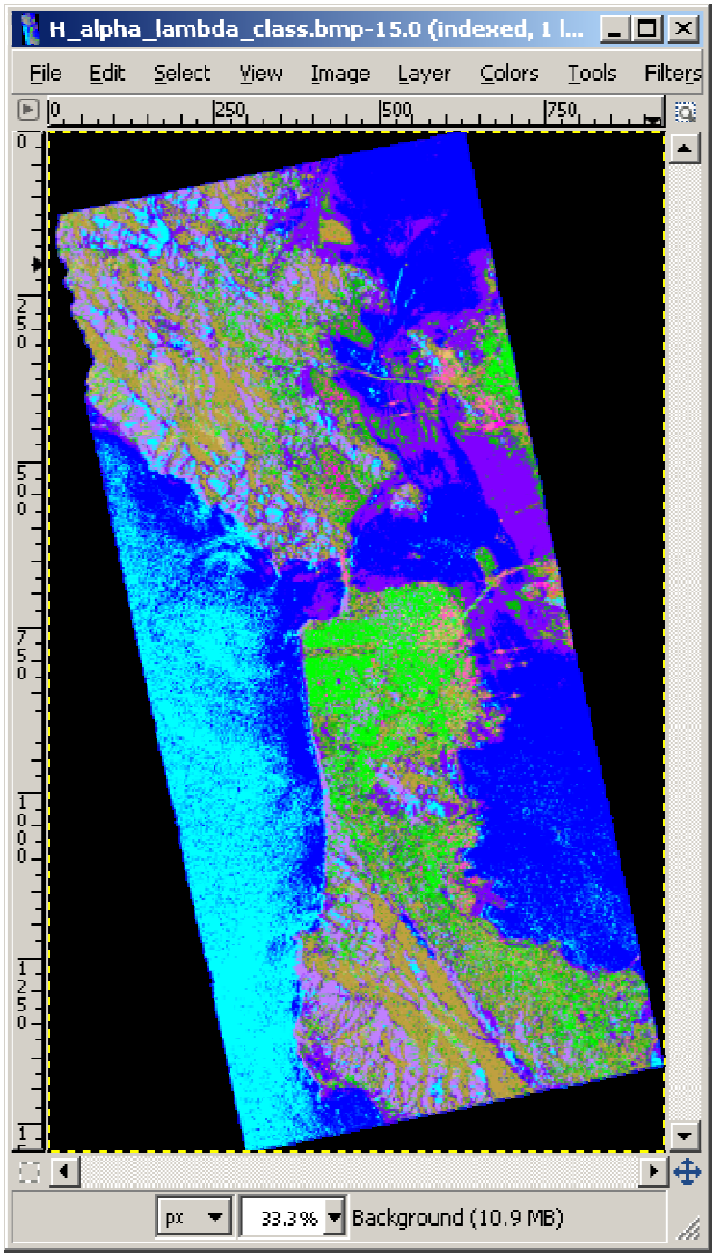


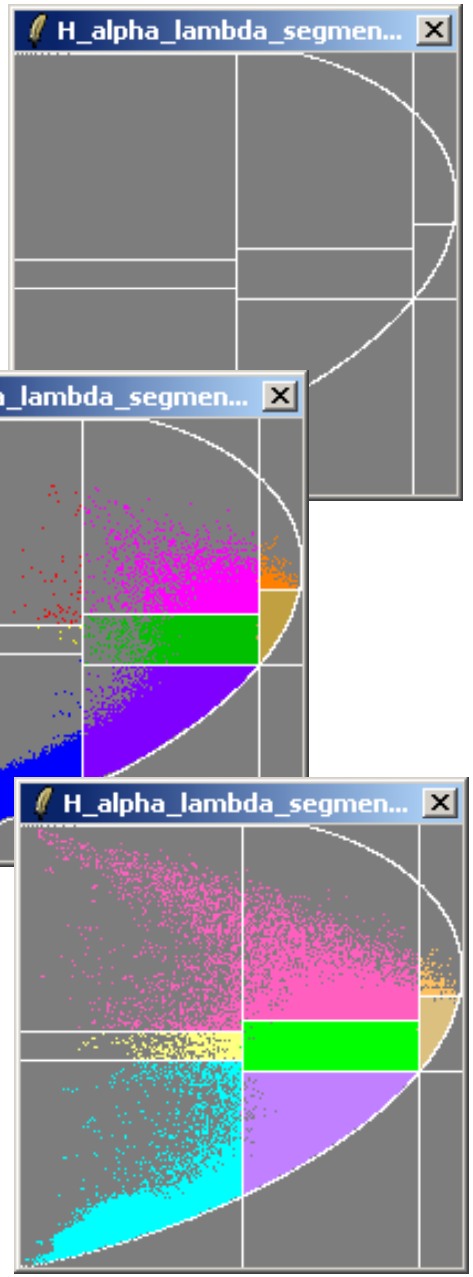
High λ

H / A / alpha CLASSIFICATION

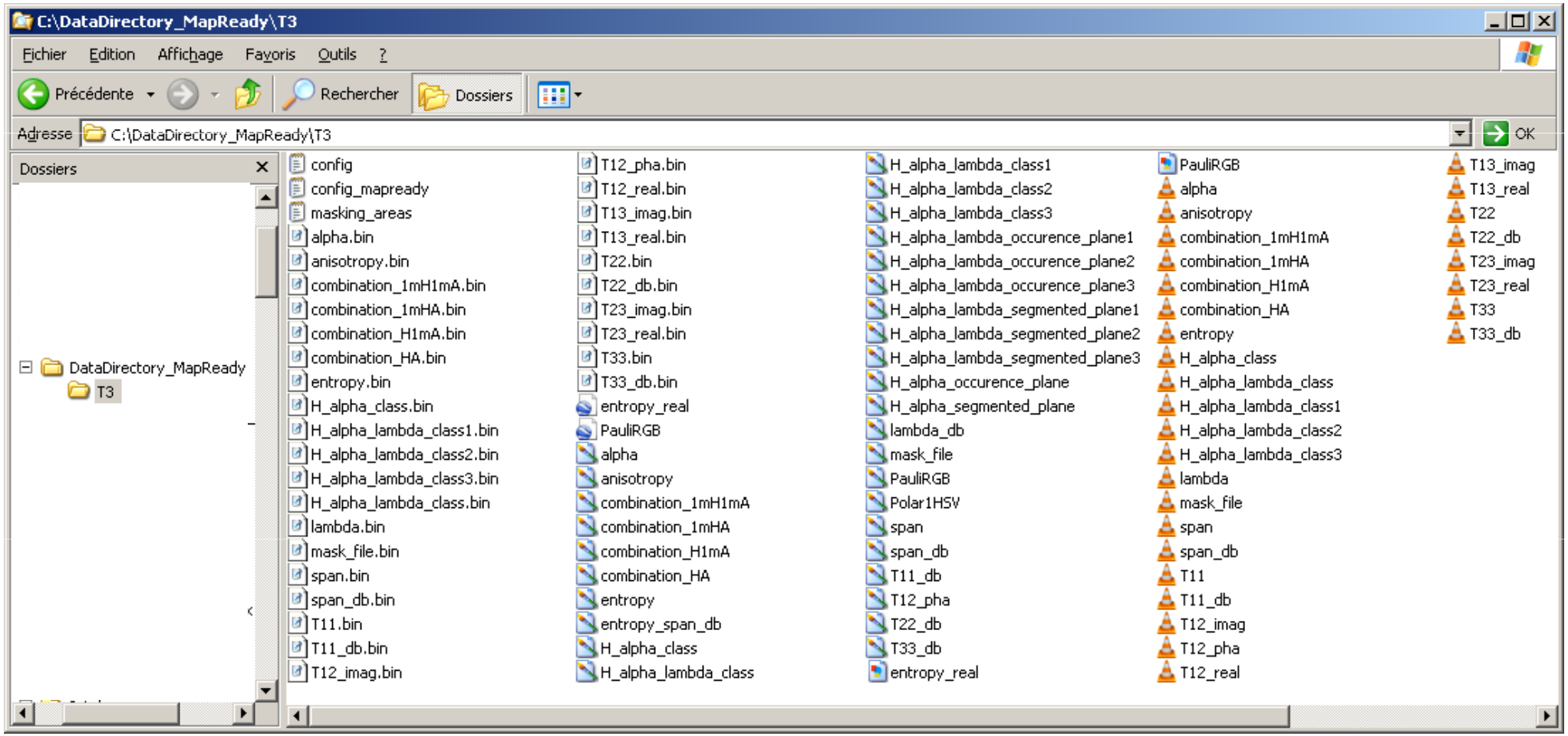


H / A / alpha CLASSIFICATION

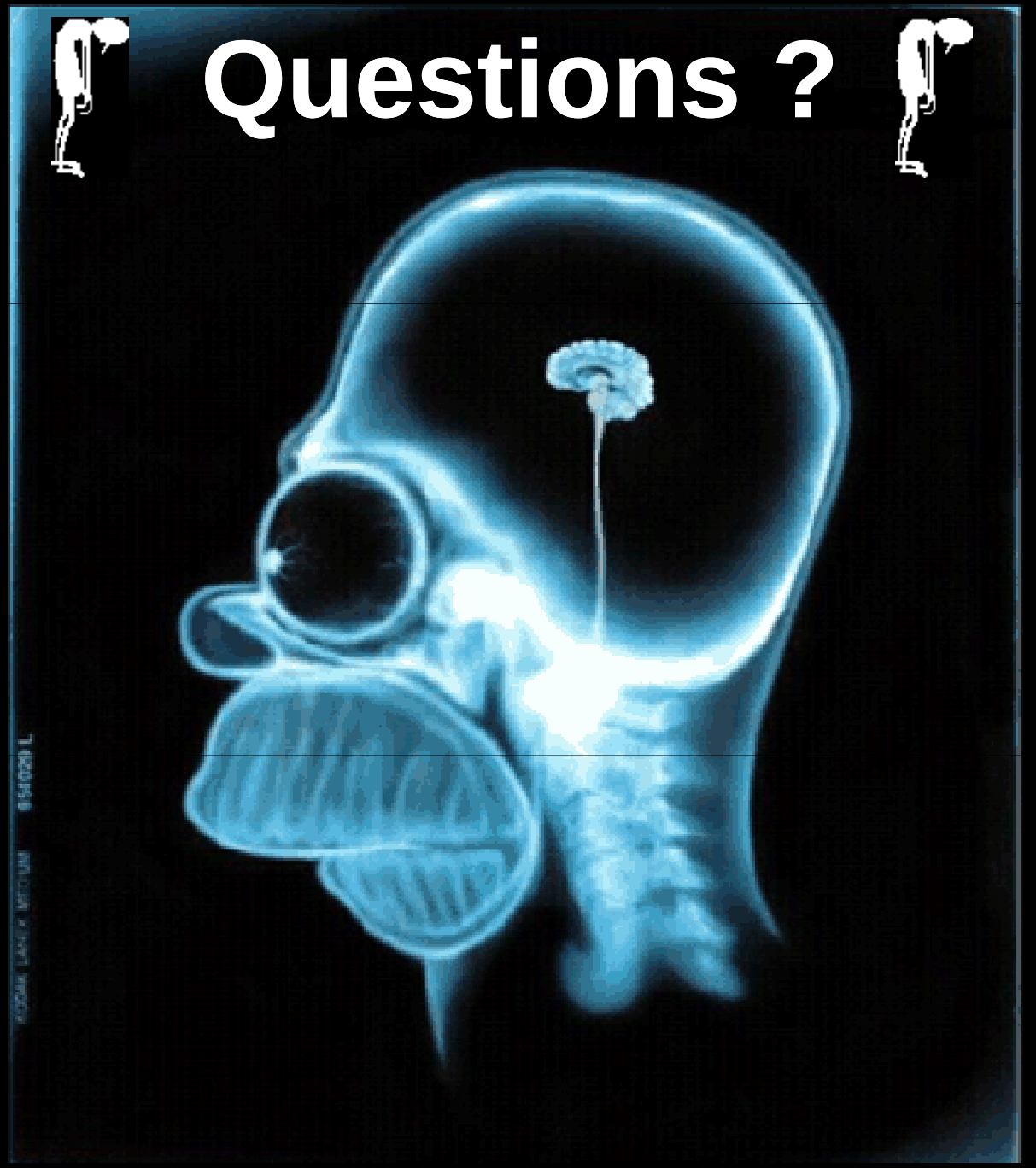




Processing Configuration



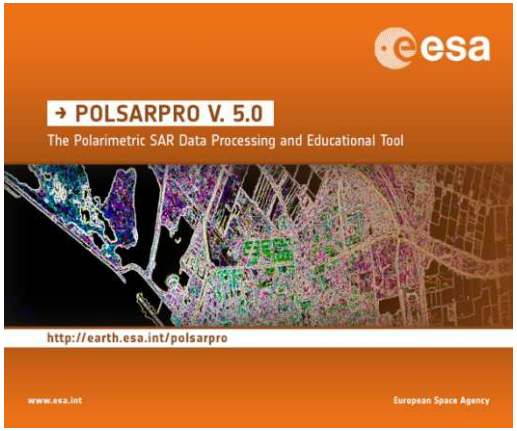
Questions ?



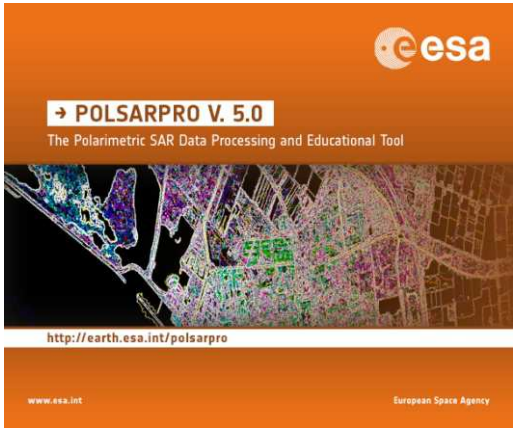
→ 3rd ADVANCED COURSE ON RADAR POLARIMETRY

PolSARpro v5.0

Practical – Part 2

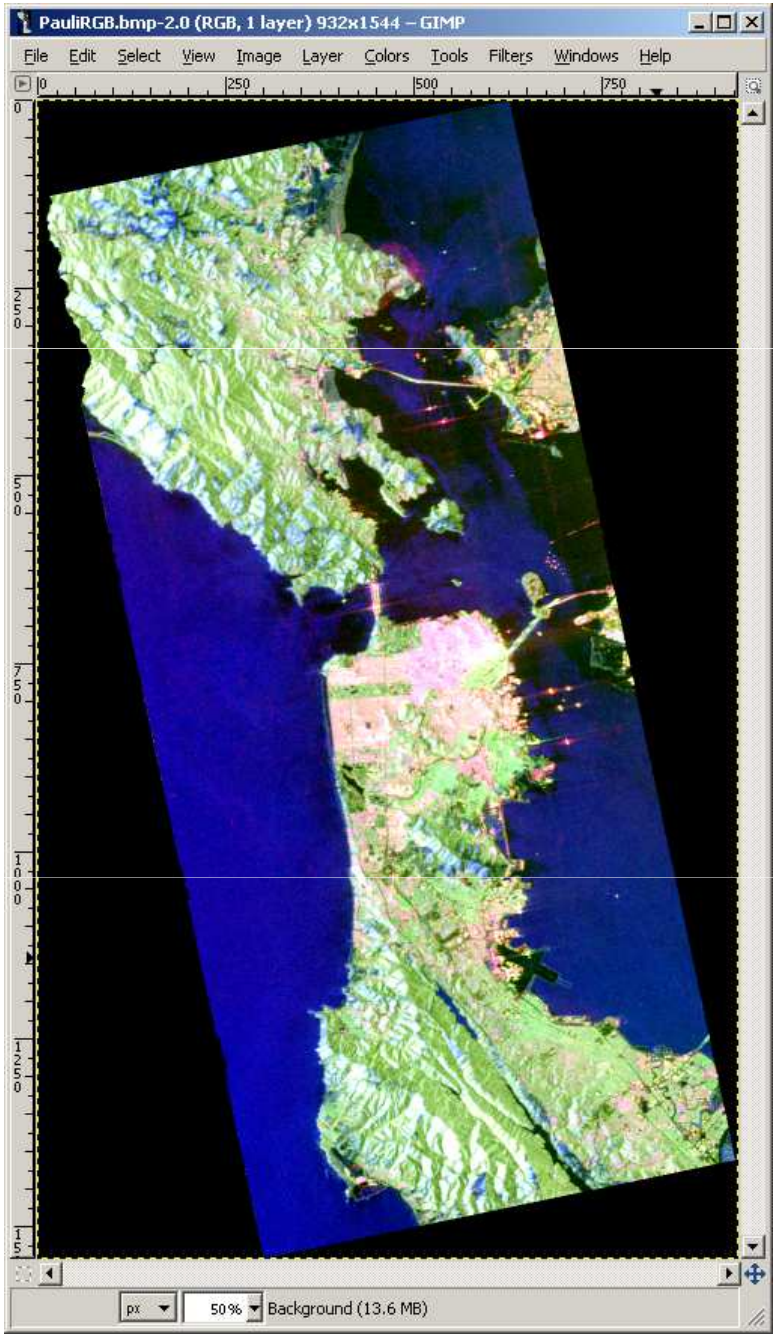


Eric POTTIER



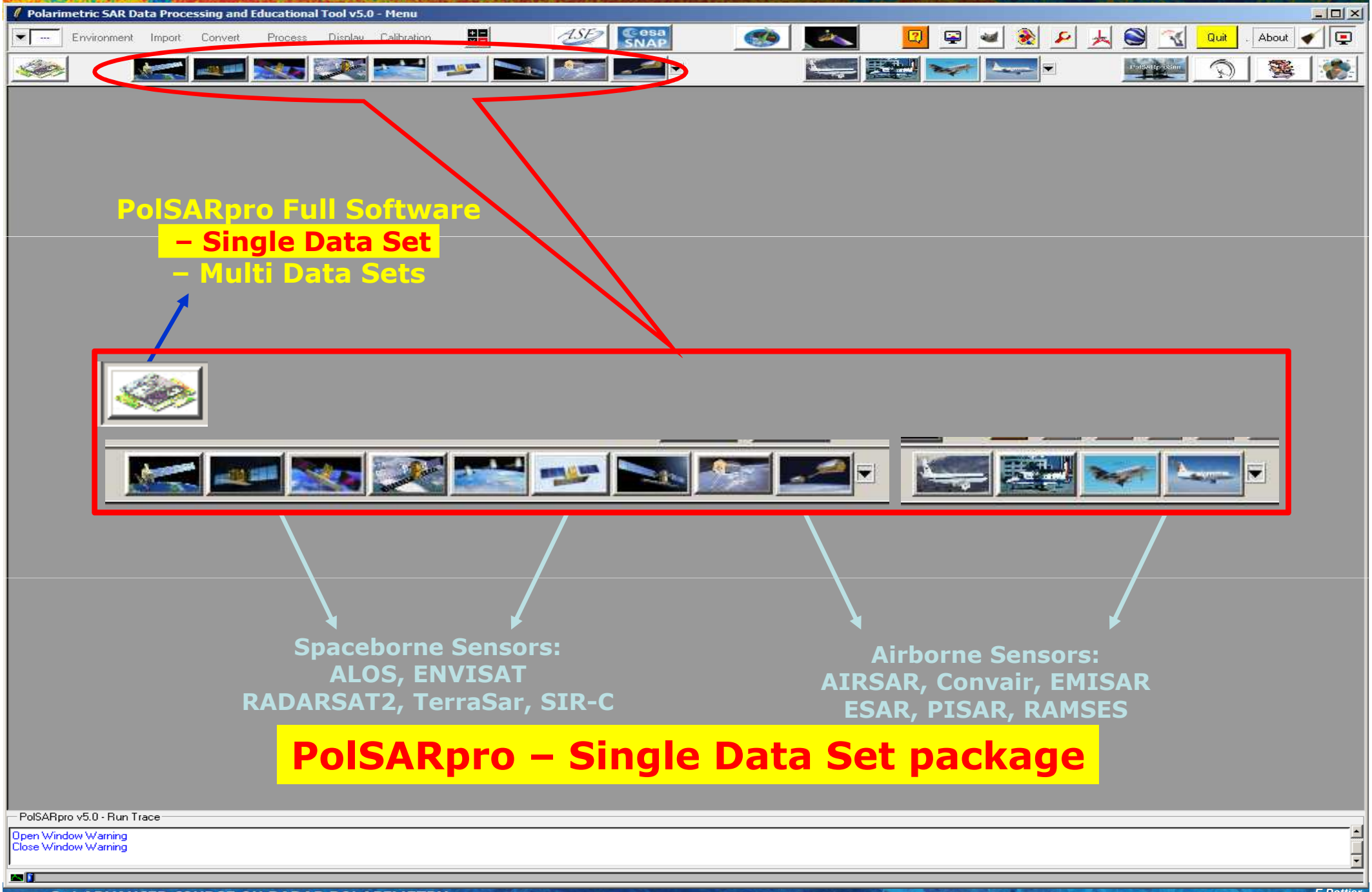
19–23 January 2015 | ESA-ESRIN | Frascati (Rome), Italy

European Space Agency

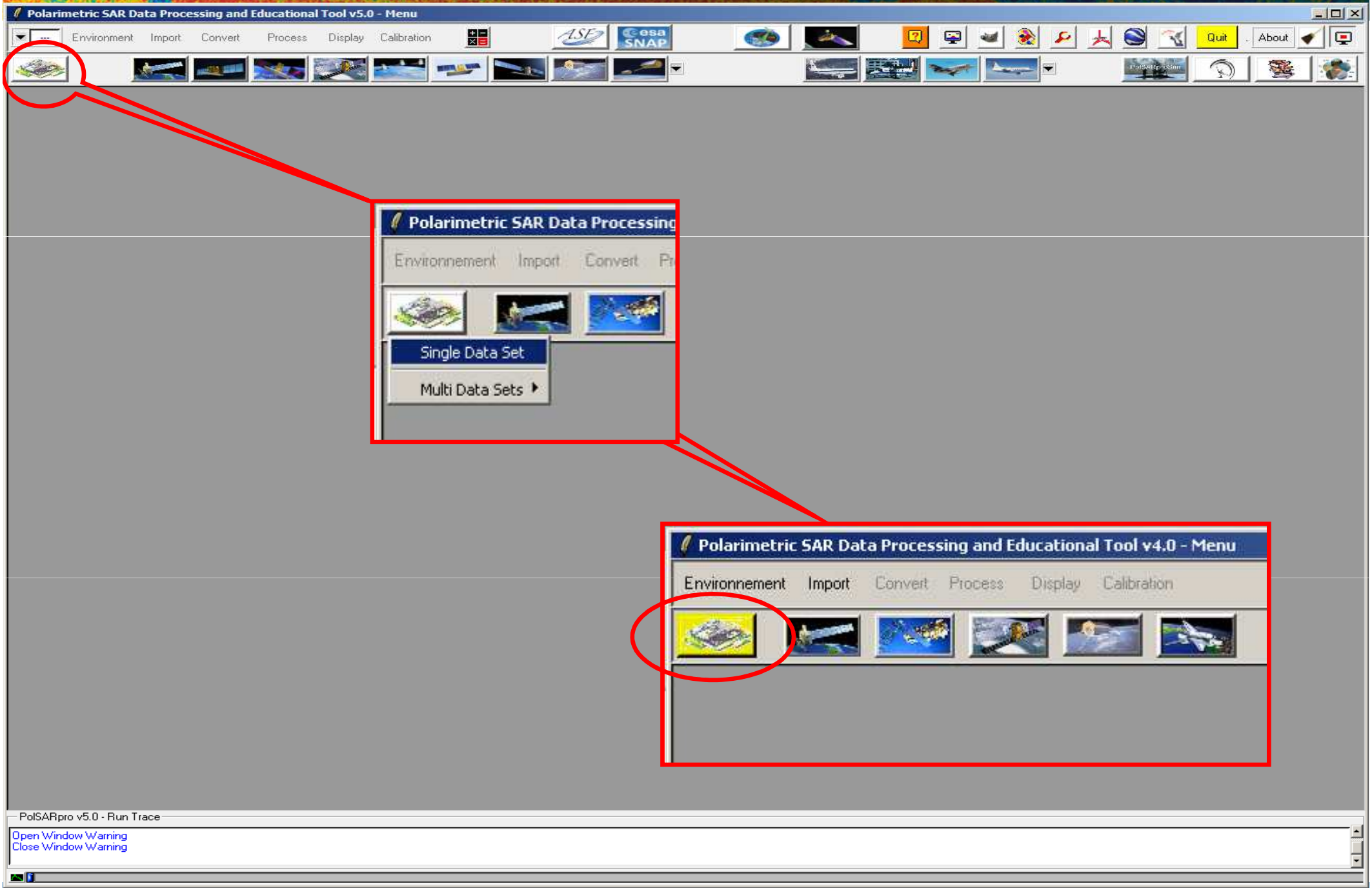


ALOS : Advanced Land Observing Satellite
PALSAR : Phase Array L-Band SAR

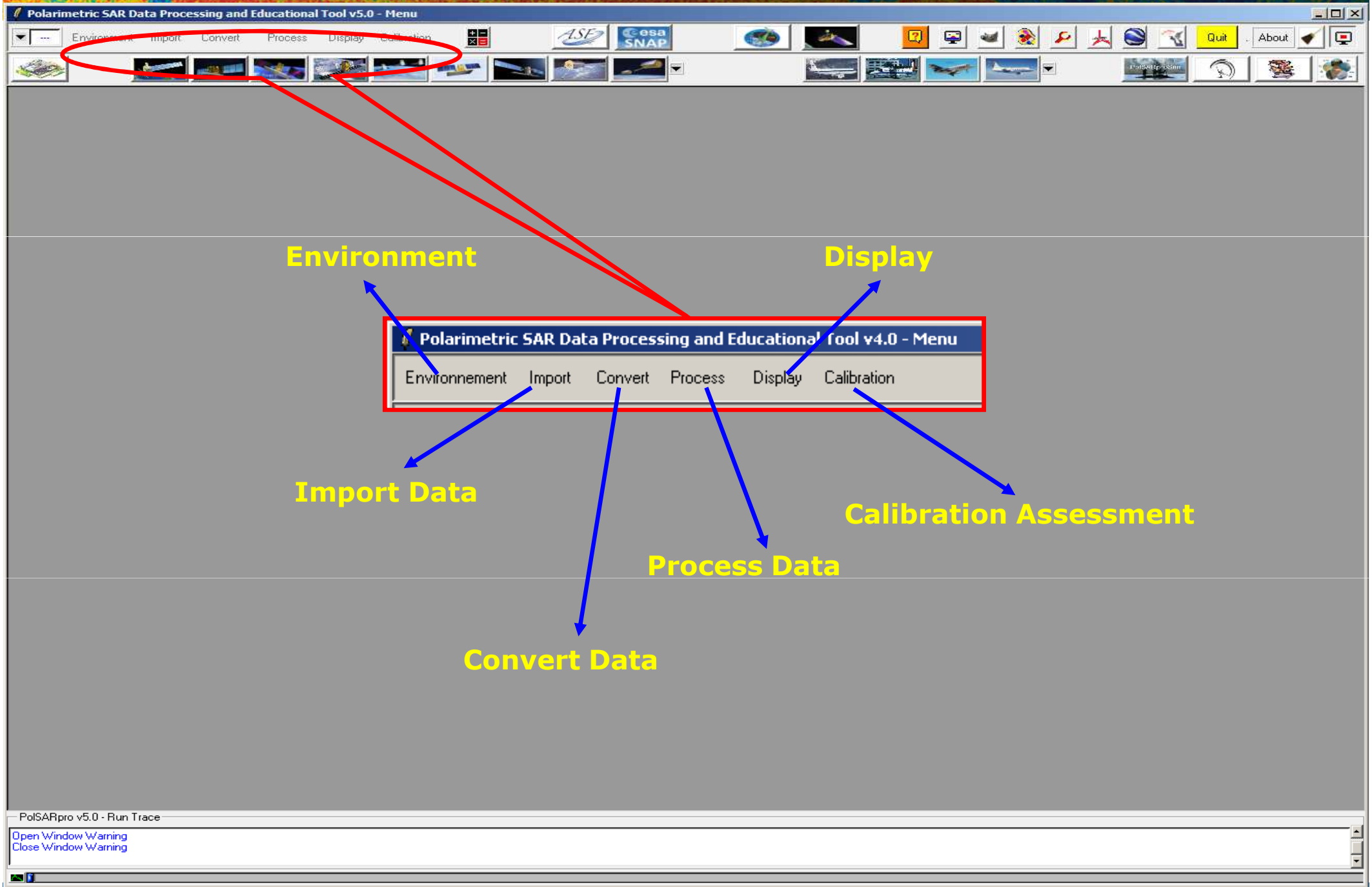
PolSARpro v5.0 SOFTWARE



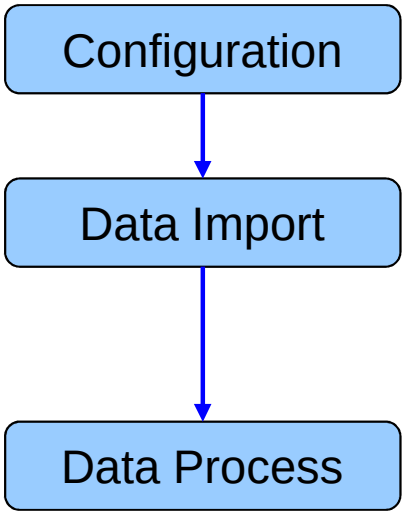
MAIN MENU


Polarimetric SAR Data Processing and Educational Tool v5.0 - Menu
Environment
Import
Convert
Process
Display
Calibration
Quit
About
Polarimetric SAR Data Processing
Environnement
Import
Convert
Single Data Set
Multi Data Sets
Polarimetric SAR Data Processing and Educational Tool v4.0 - Menu
Environnement
Import
Convert
Process
Display
Calibration
PolSARpro v5.0 - Run Trace
Open Window Warning
Close Window Warning

MAIN MENU


Polarimetric SAR Data Processing and Educational Tool v5.0 - Menu
Environment
Import
Convert
Process
Display
Calibration
Quit
About
Polarimetric SAR Data Processing and Educational Tool v4.0 - Menu
Environnement
Import
Convert
Process
Display
Calibration
Environment
Display
Import Data
Calibration Assessment
Process Data
Convert Data
PolSARpro v5.0 - Run Trace
Open Window Warning
Close Window Warning

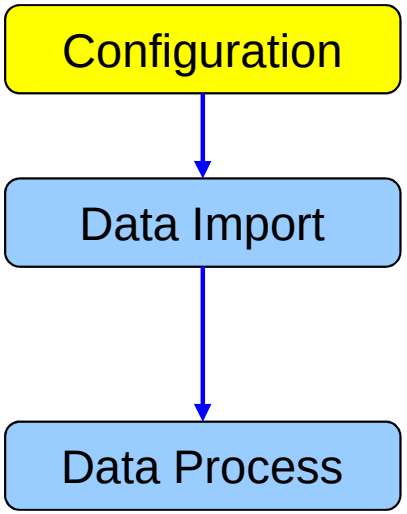
PROCESSING CHAIN



- Input Data File:
  - Spaceborne Sensors
- Extract Raw Data

- Eigenvalue Parameters
- Polarimetric Decomposition
  - Freeman
  - Van Zyl
- Polarimetric Functionalities
  - Polarimetric Synthesis
  - Polarimetric Signatures
  - Polarized Point Scatterer Detection
- Polarimetric Segmentation
  - Wishart - H / A / alpha classification
  - Supervised Wishart classification
  - Support Vector Machine Classification

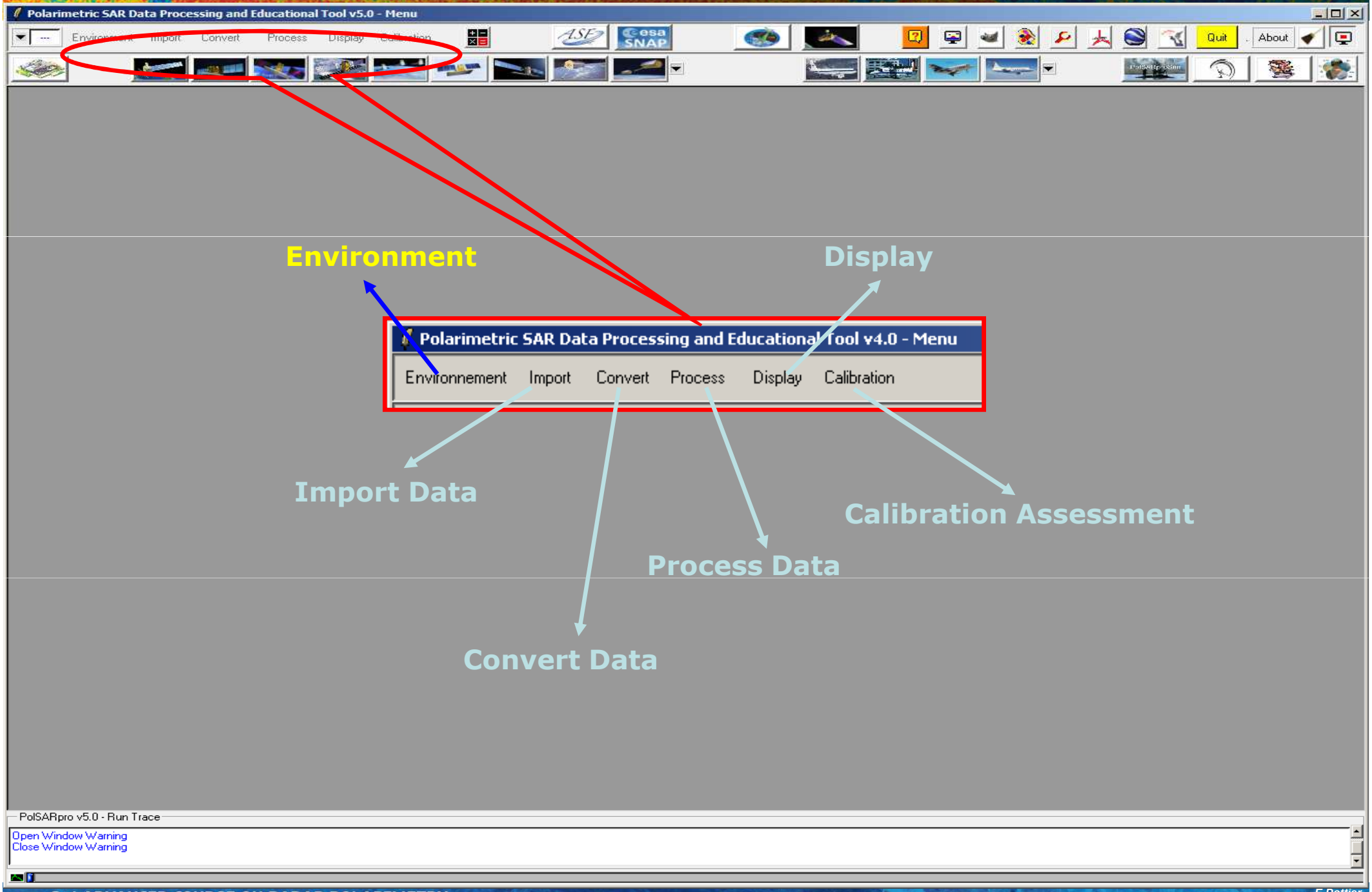
PROCESSING CHAIN

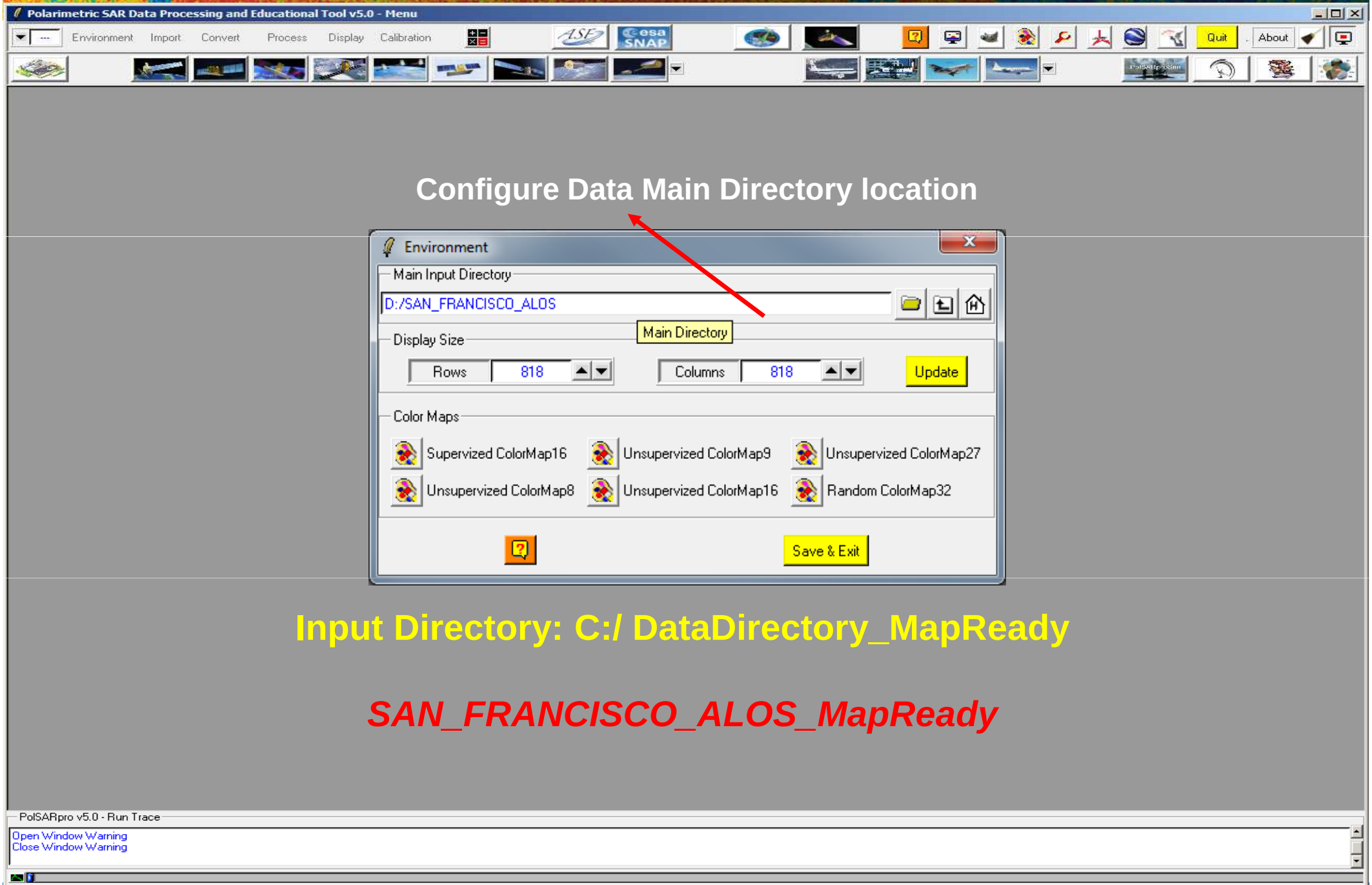


- Input Data File:
  - Spaceborne Sensors
- Extract Raw Data

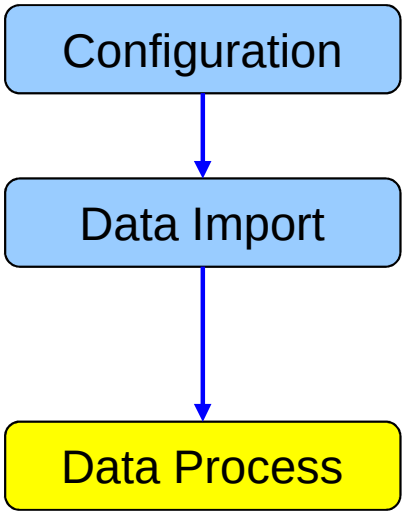
- Eigenvalue Parameters
- Polarimetric Decomposition
  - Freeman
  - Van Zyl
- Polarimetric Functionalities
  - Polarimetric Synthesis
  - Polarimetric Signatures
  - Polarized Point Scatterer Detection
- Polarimetric Segmentation
  - Wishart - H / A / alpha classification
  - Supervised Wishart classification
  - Support Vector Machine Classification

ENVIRONNEMENT




Polarimetric SAR Data Processing and Educational Tool v5.0 - Menu
Environment
Import
Convert
Process
Display
Calibration
Quit
About
Configure Data Main Directory location
Environment
Main Input Directory
D:/SAN_FRANCISCO_ALOS
Main Directory
Display Size
Rows
818
Columns
818
Update
Color Maps
Supervized ColorMap16
Unsupervized ColorMap9
Unsupervized ColorMap27
Unsupervized ColorMap8
Unsupervized ColorMap16
Random ColorMap32
Save & Exit
Input Directory: C:/ DataDirectory_MapReady
SAN_FRANCISCO_ALOS_MapReady
PolSARpro v5.0 - Run Trace
Open Window Warning
Close Window Warning

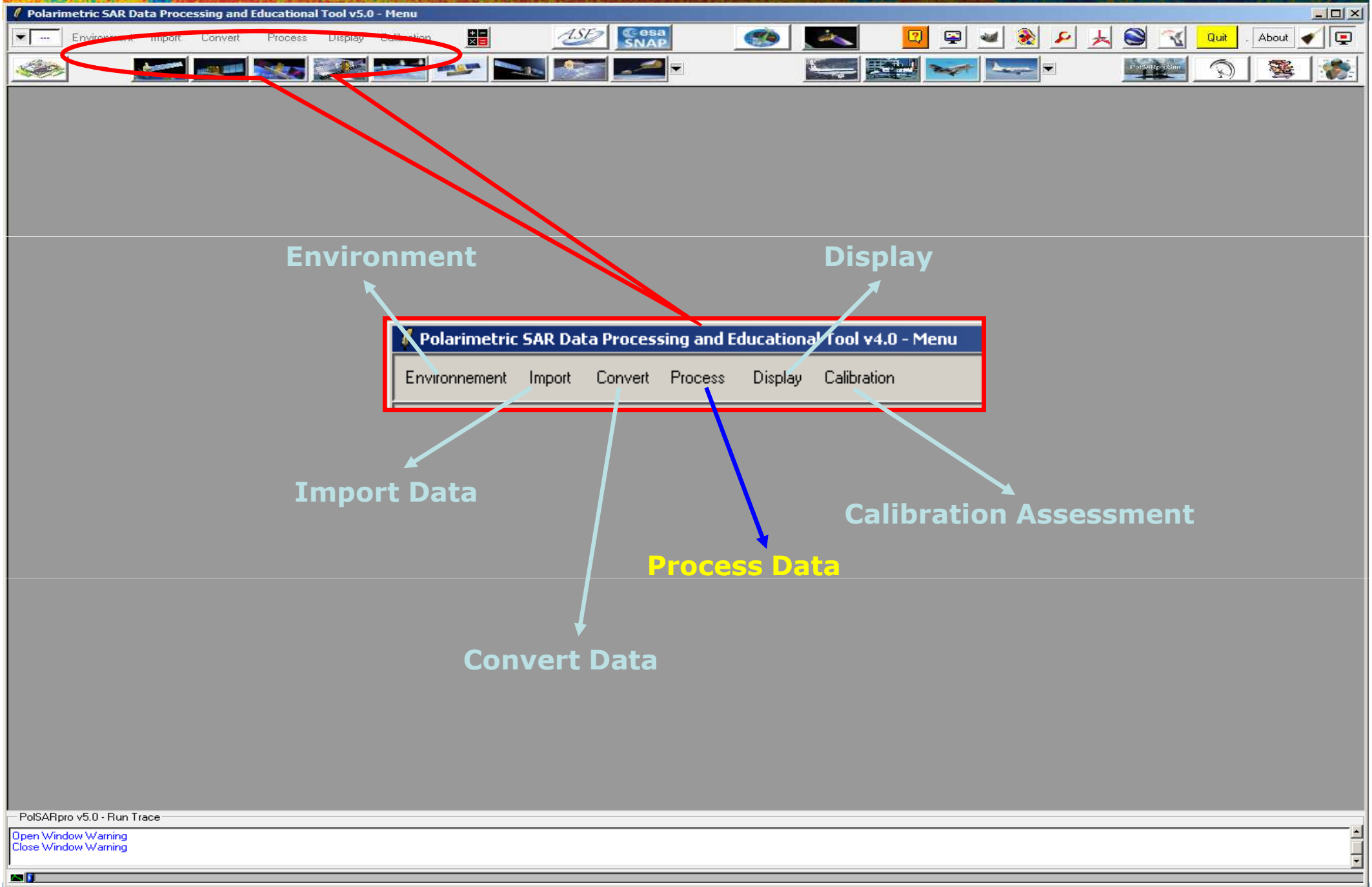
PROCESSING CHAIN



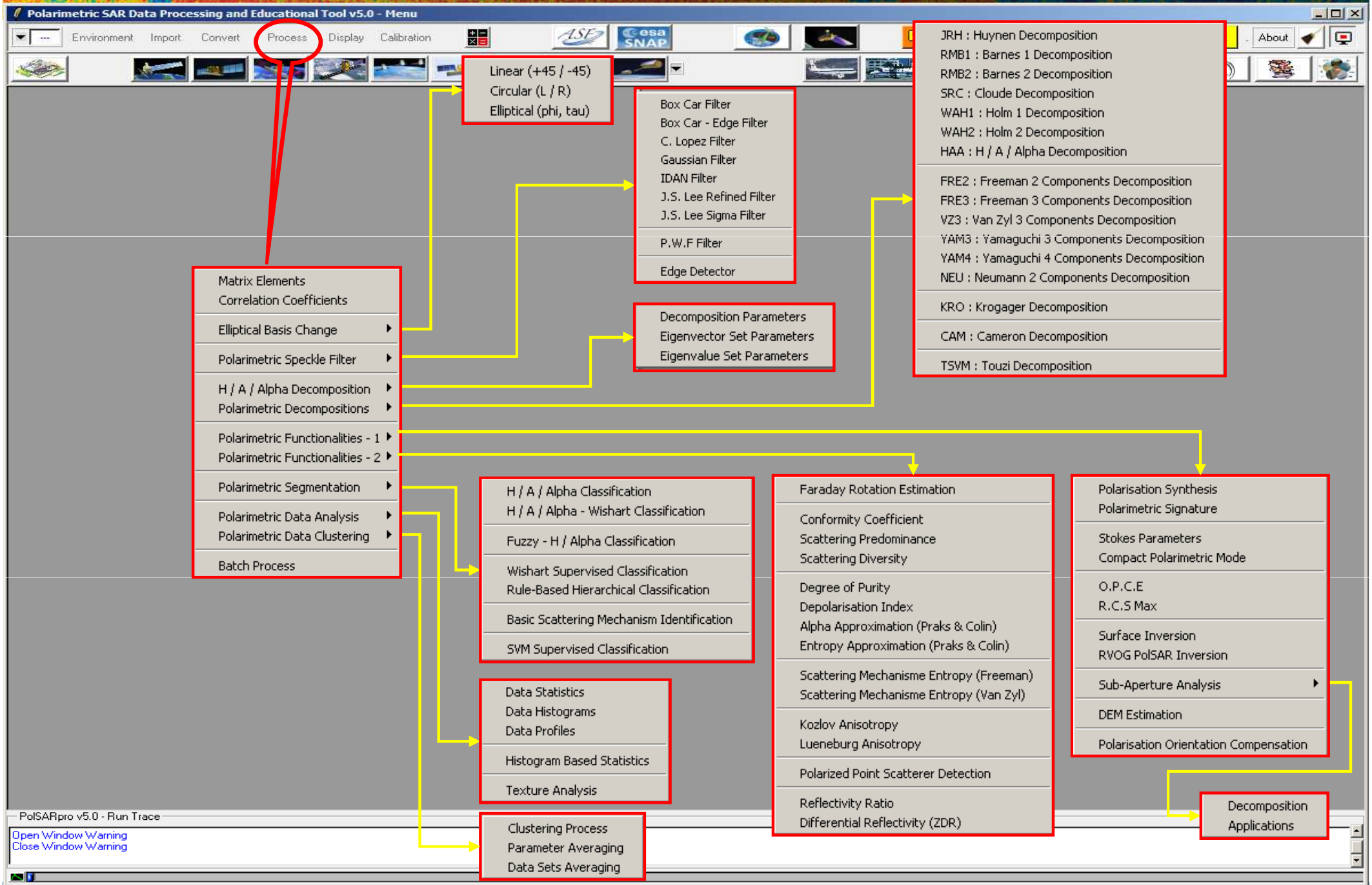
- Input Data File:
  - Spaceborne Sensors
- Extract Raw Data

- Eigenvalue Parameters
- Polarimetric Decomposition
  - Freeman
  - Van Zyl
- Polarimetric Functionalities
  - Polarimetric Synthesis
  - Polarimetric Signatures
  - Polarized Point Scatterer Detection
- Polarimetric Segmentation
  - Wishart - H / A / alpha classification
  - Supervised Wishart classification
  - Support Vector Machine Classification

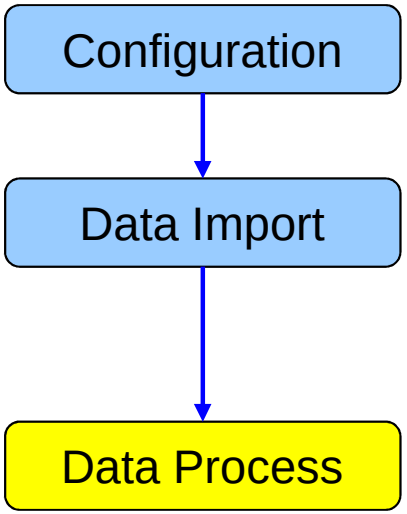
PROCESS DATA



PROCESS DATA



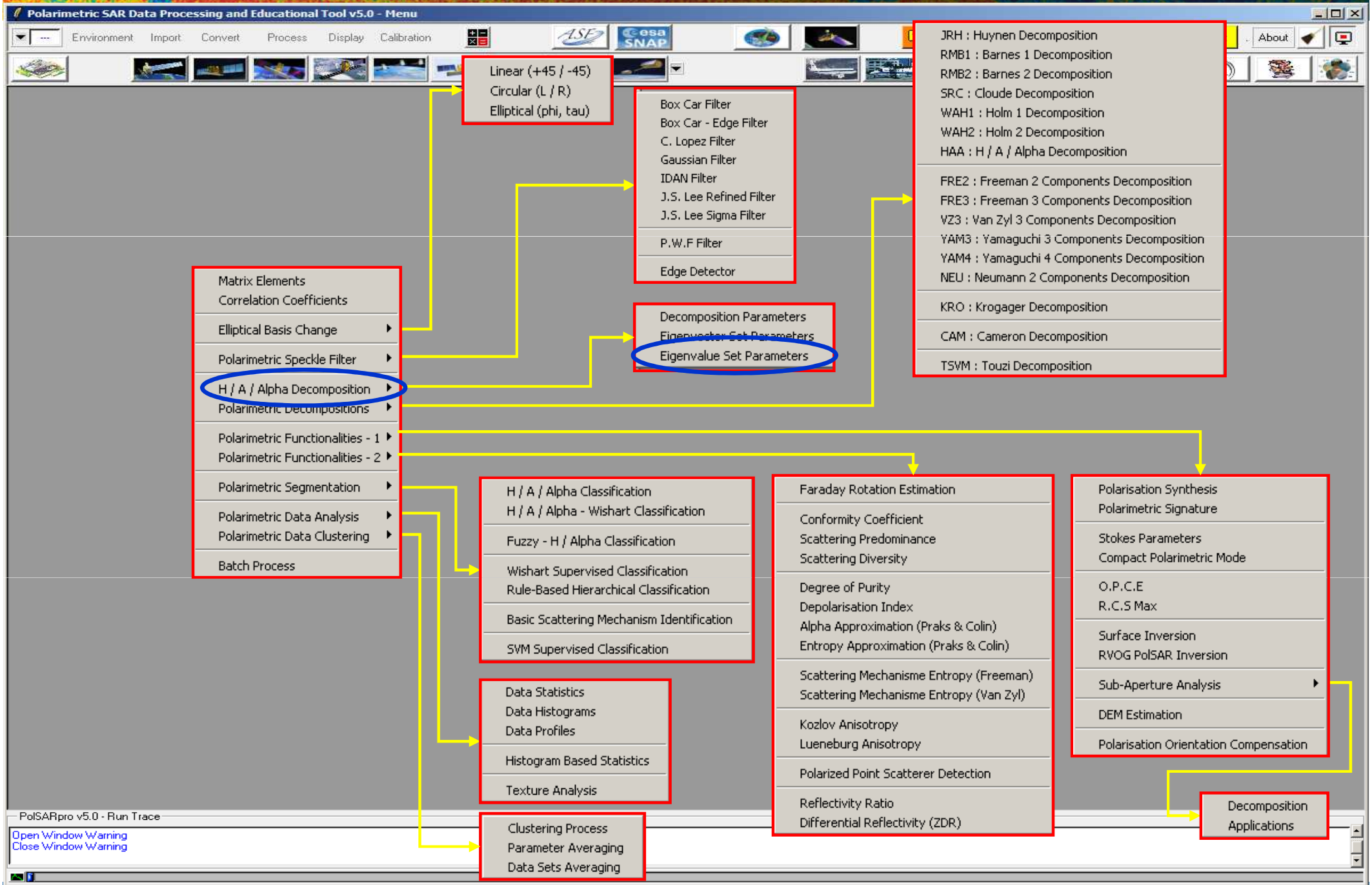
PROCESSING CHAIN



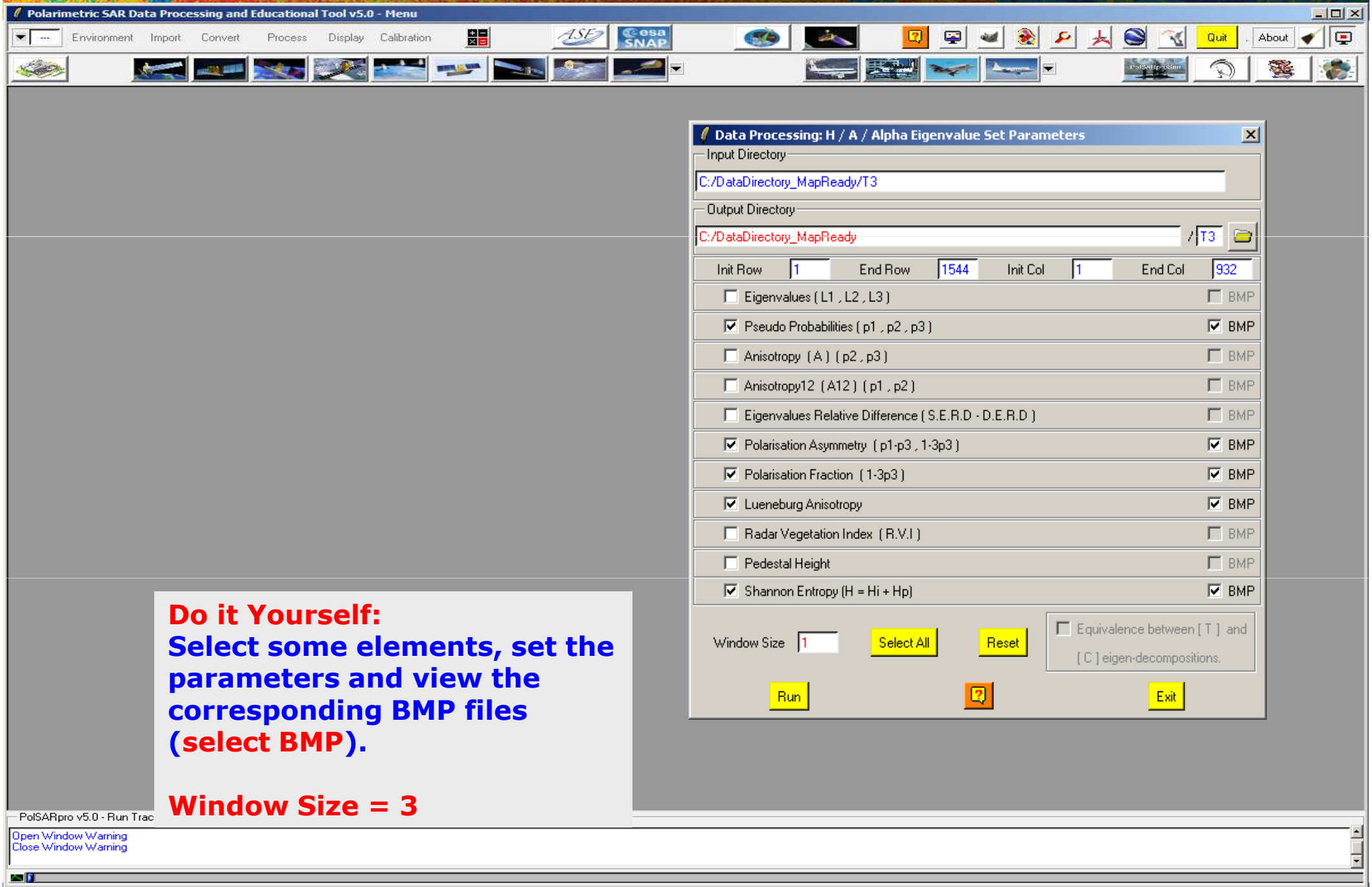
- Input Data File:
  - Spaceborne Sensors
- Extract Raw Data

- Eigenvalue Parameters
- Polarimetric Decomposition
  - Freeman
  - Van Zyl
- Polarimetric Functionalities
  - Polarimetric Synthesis
  - Polarimetric Signatures
  - Polarized Point Scatterer Detection
- Polarimetric Segmentation
  - Wishart - H / A / alpha classification
  - Supervised Wishart classification
  - Support Vector Machine Classification

PROCESS DATA



EIGENVALUE SET PARAMETERS

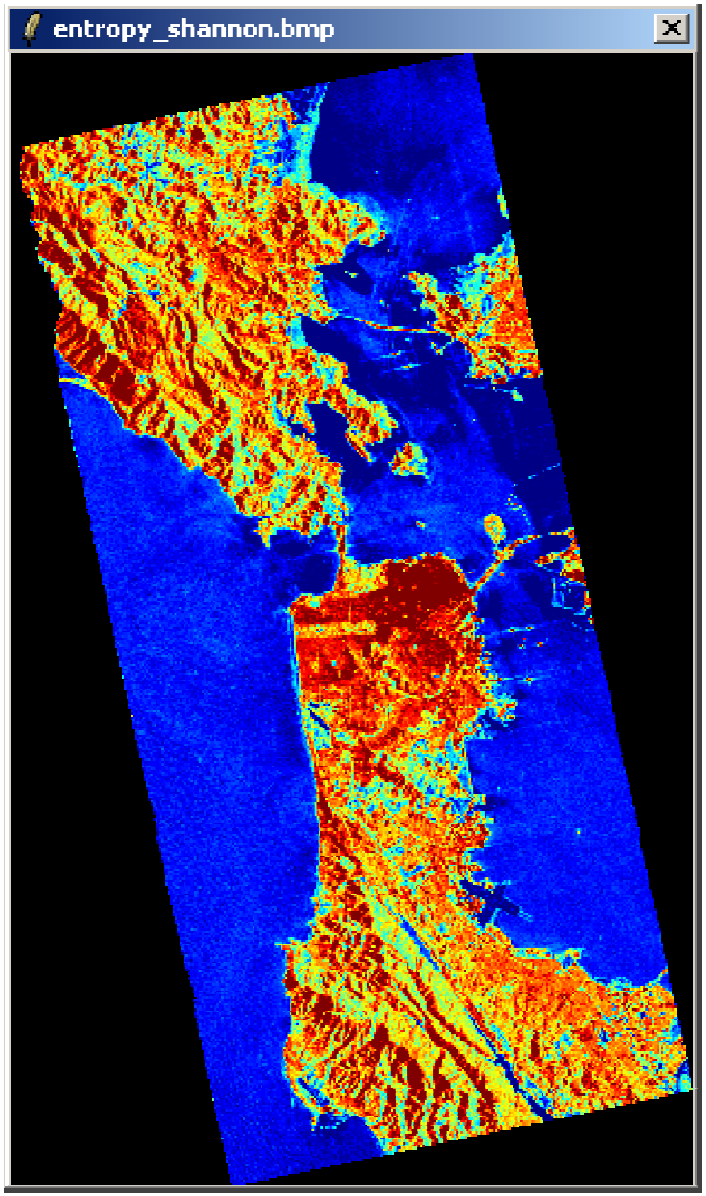


Do it Yourself:
Select some elements, set the parameters and view the corresponding BMP files (select BMP).

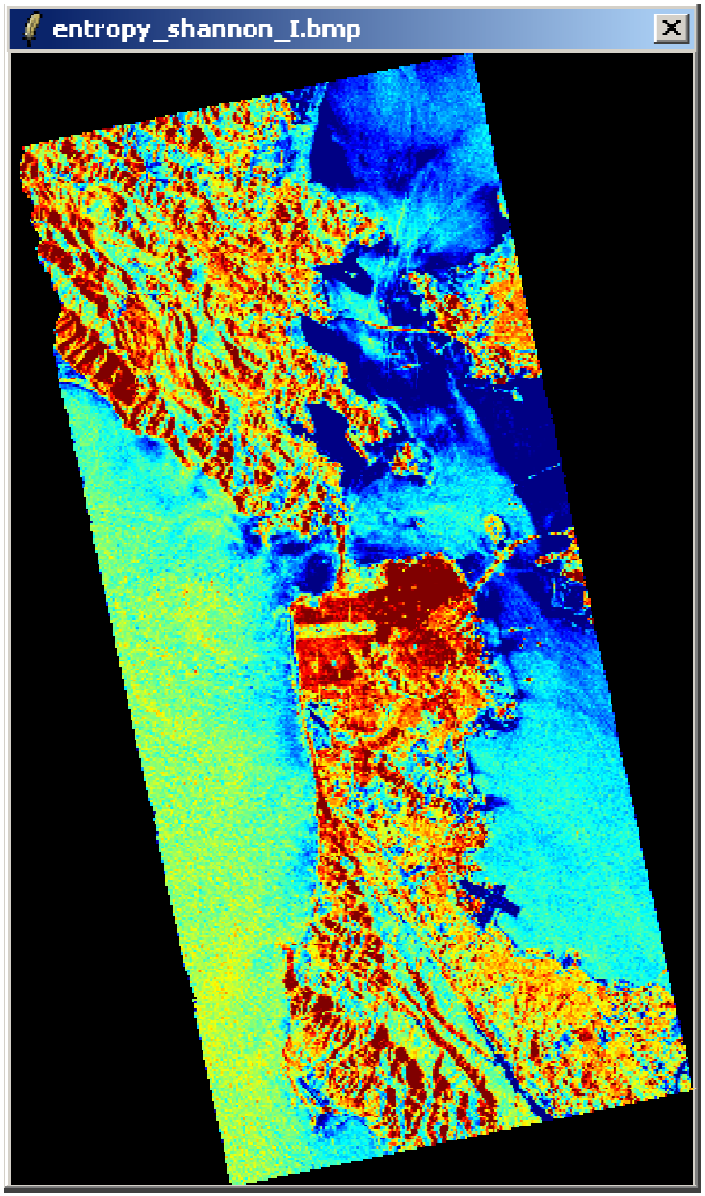
Window Size = 3

EIGENVALUE SET PARAMETERS

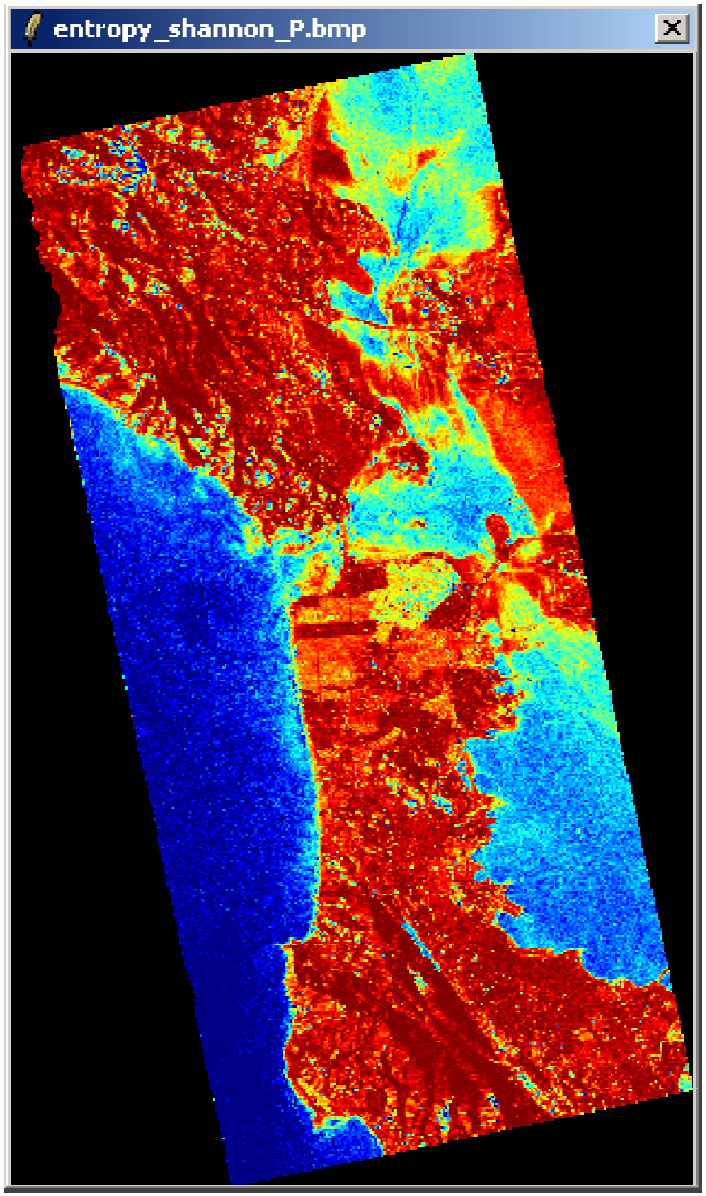
Entropy Shannon



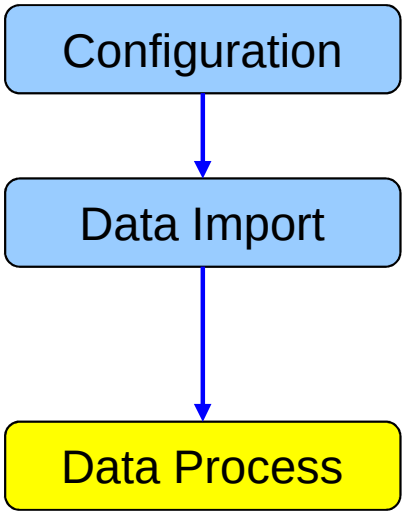
Entropy I



Entropy P



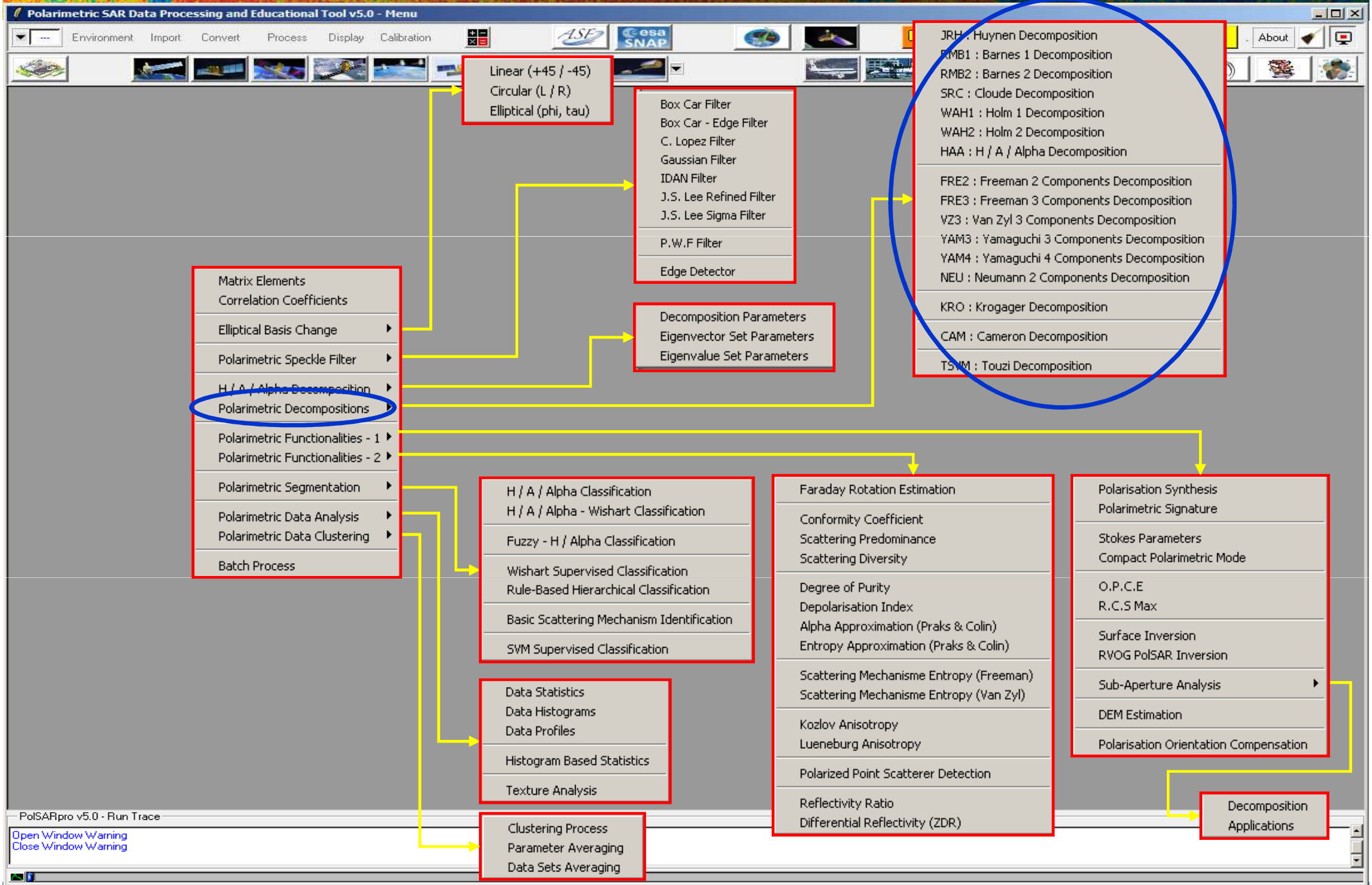
PROCESSING CHAIN



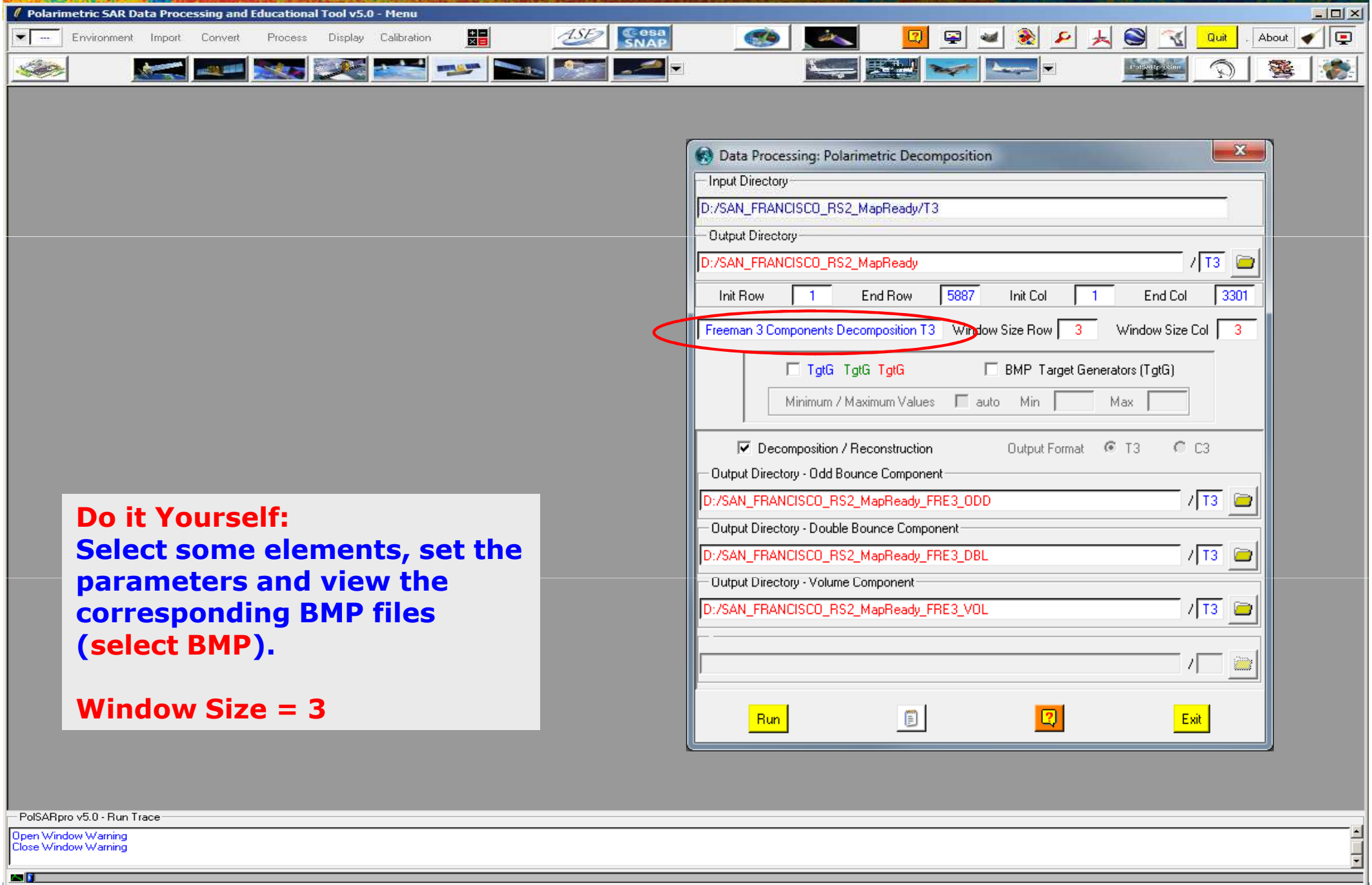
- Input Data File:
  - Spaceborne Sensors
- Extract Raw Data

- Eigenvalue Parameters
- Polarimetric Decomposition
  - Freeman
  - Van Zyl
- Polarimetric Functionalities
  - Polarimetric Synthesis
  - Polarimetric Signatures
  - Polarized Point Scatterer Detection
- Polarimetric Segmentation
  - Wishart - H / A / alpha classification
  - Supervised Wishart classification
  - Support Vector Machine Classification

PROCESS DATA



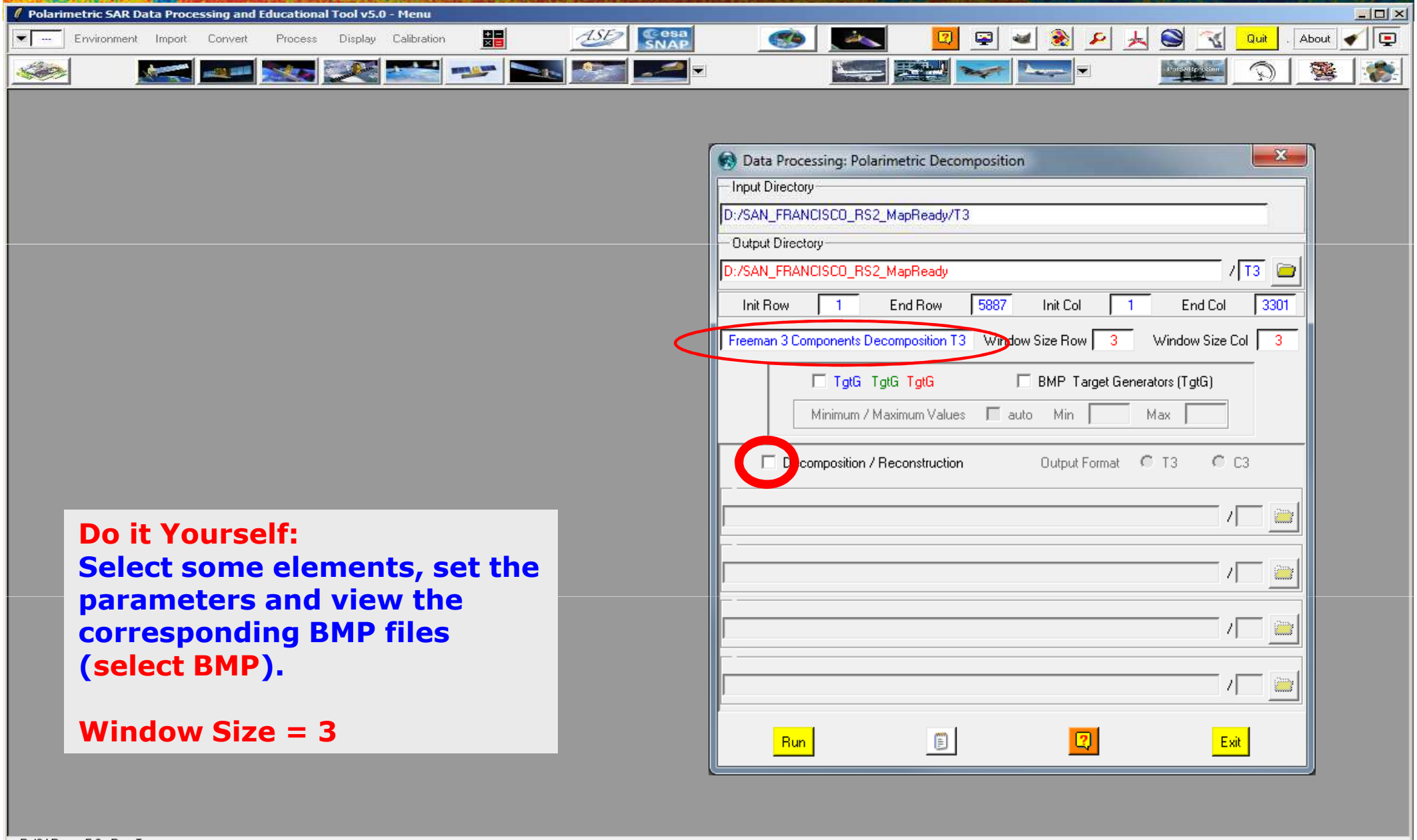
POLARIMETRIC DECOMPOSITION



Do it Yourself:
Select some elements, set the parameters and view the corresponding BMP files (select BMP).

Window Size = 3

POLARIMETRIC DECOMPOSITION

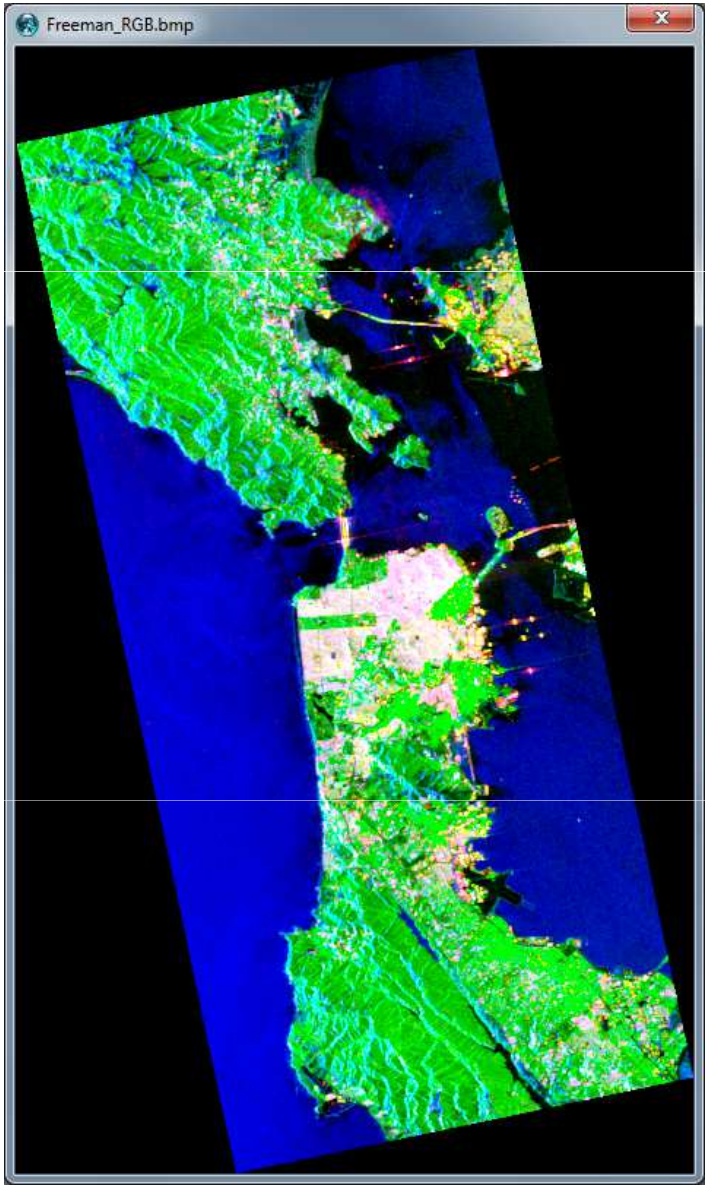


Do it Yourself:
Select some elements, set the parameters and view the corresponding BMP files (select BMP).

Window Size = 3

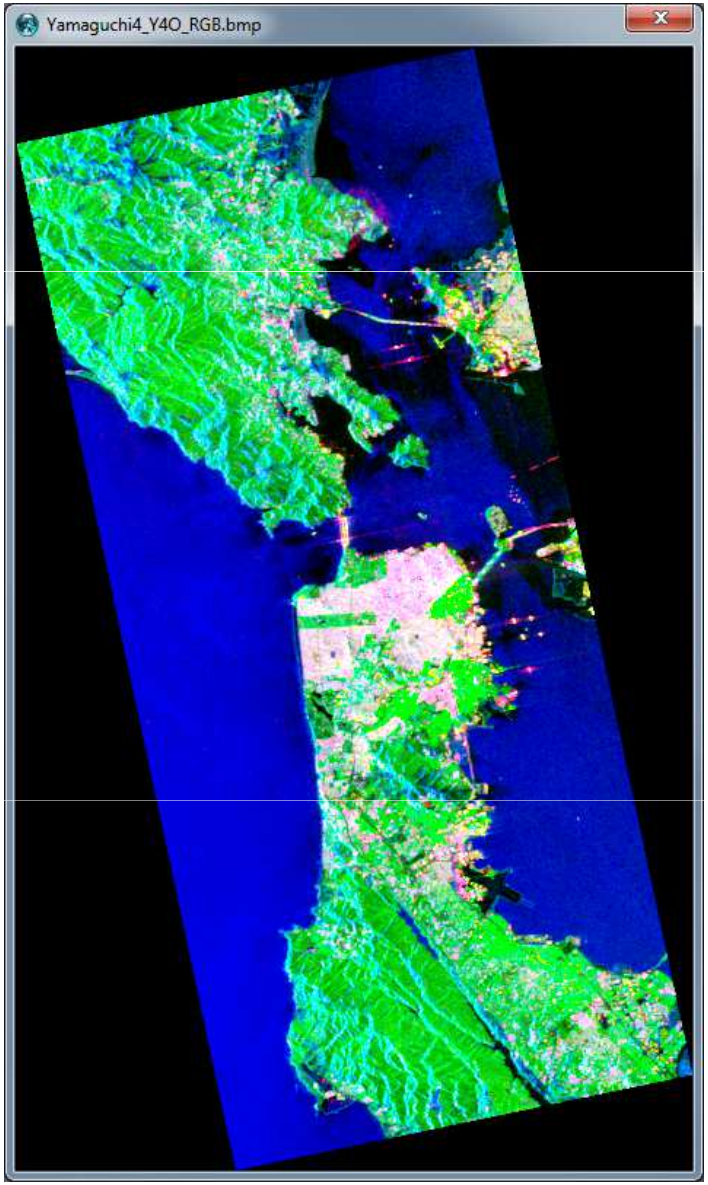
POLARIMETRIC DECOMPOSITION

Pauli Freeman 3



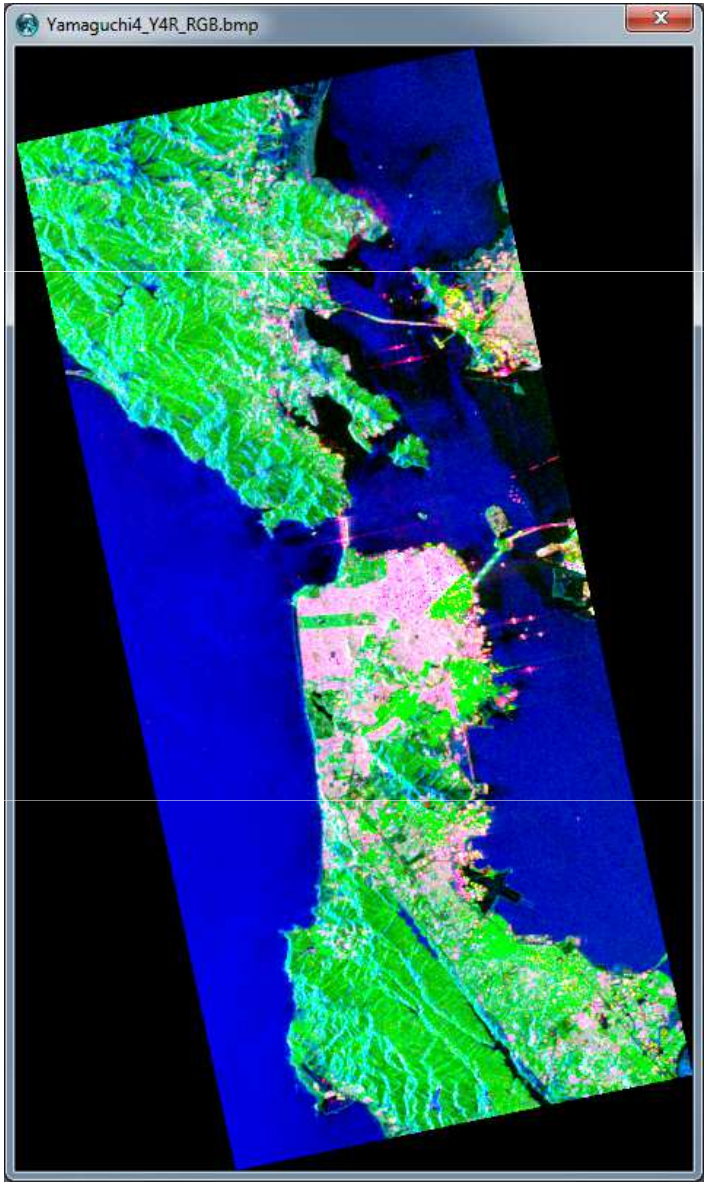
POLARIMETRIC DECOMPOSITION

Pauli Yamaguchi Y40



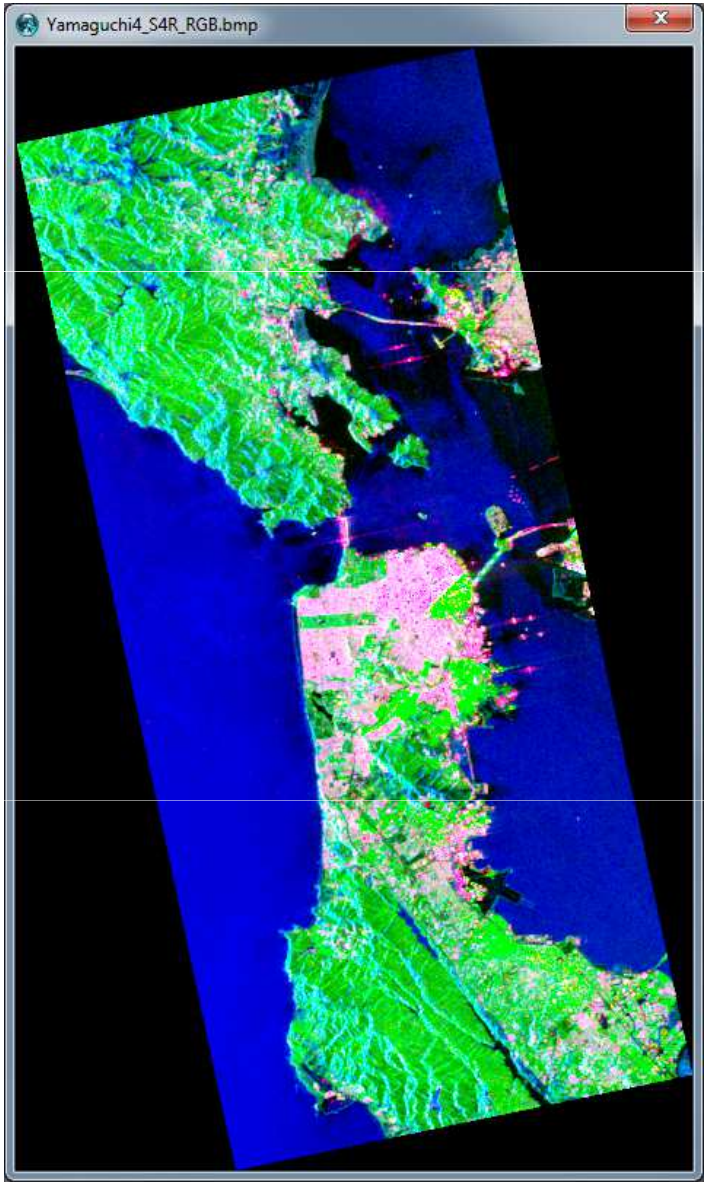
POLARIMETRIC DECOMPOSITION

Pauli Yamaguchi Y4R



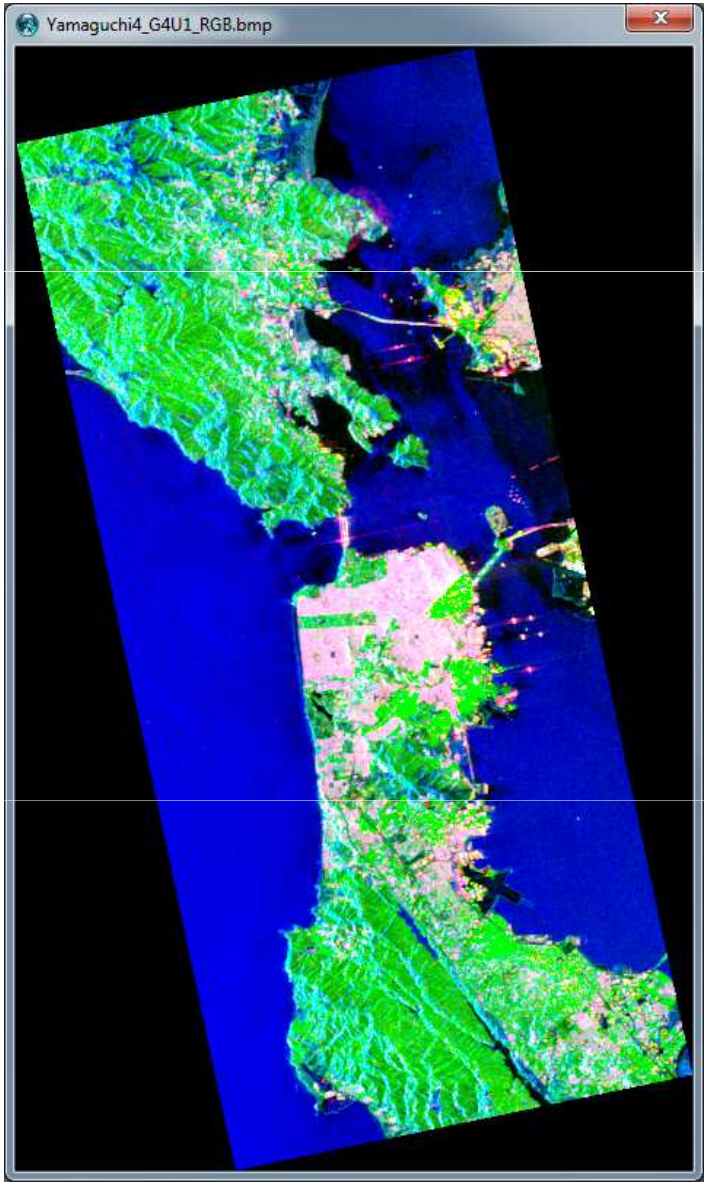
POLARIMETRIC DECOMPOSITION

Pauli Yamaguchi S4R



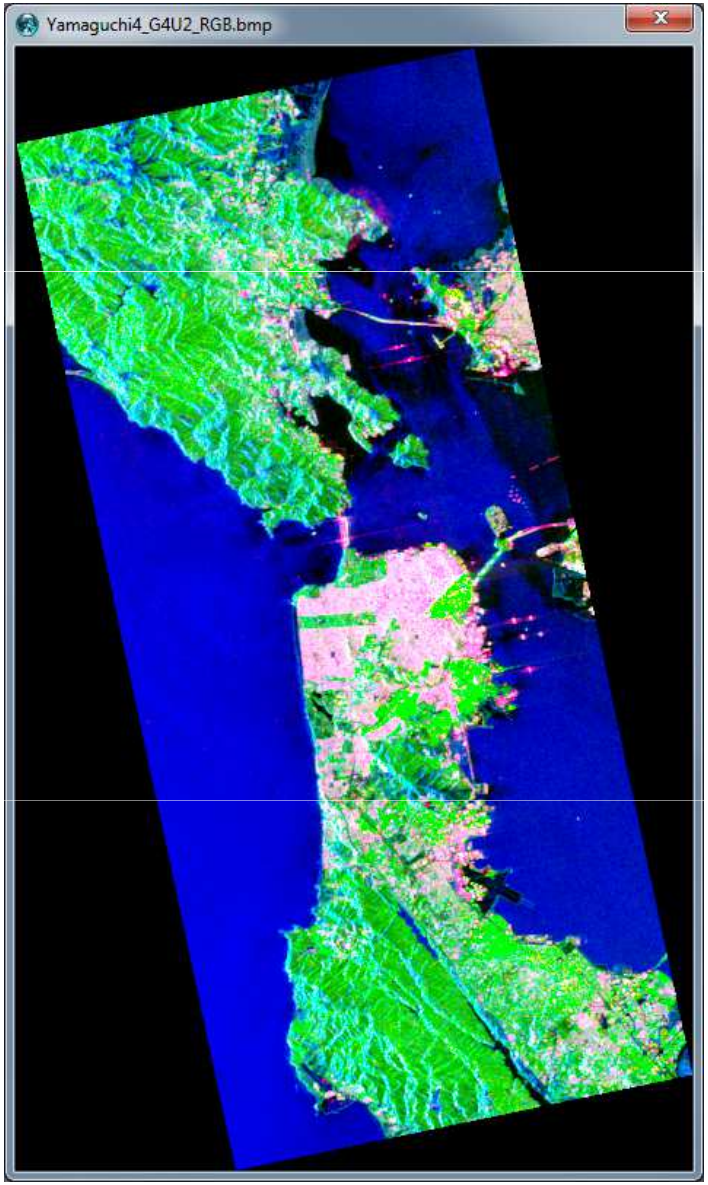
POLARIMETRIC DECOMPOSITION

Pauli Yamaguchi G4U1



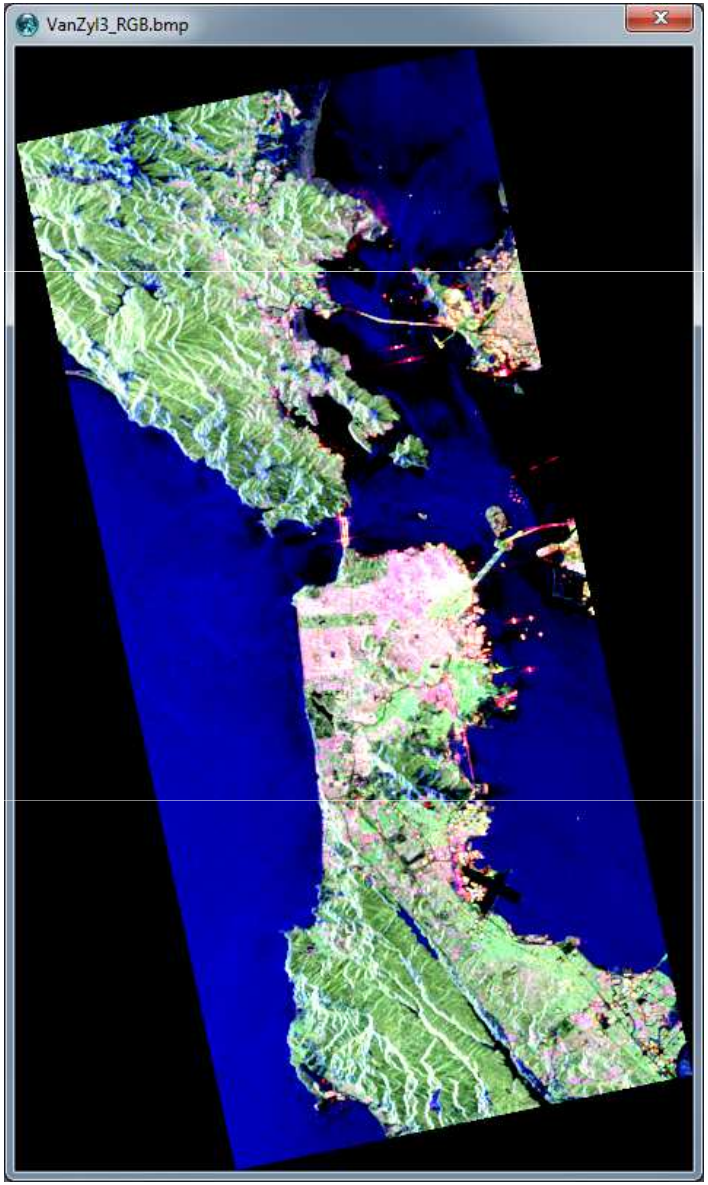
POLARIMETRIC DECOMPOSITION

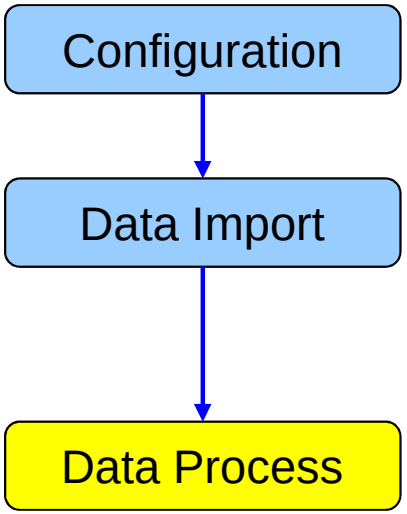
Pauli Yamaguchi G4U2



POLARIMETRIC DECOMPOSITION

Pauli Van Zyl 3

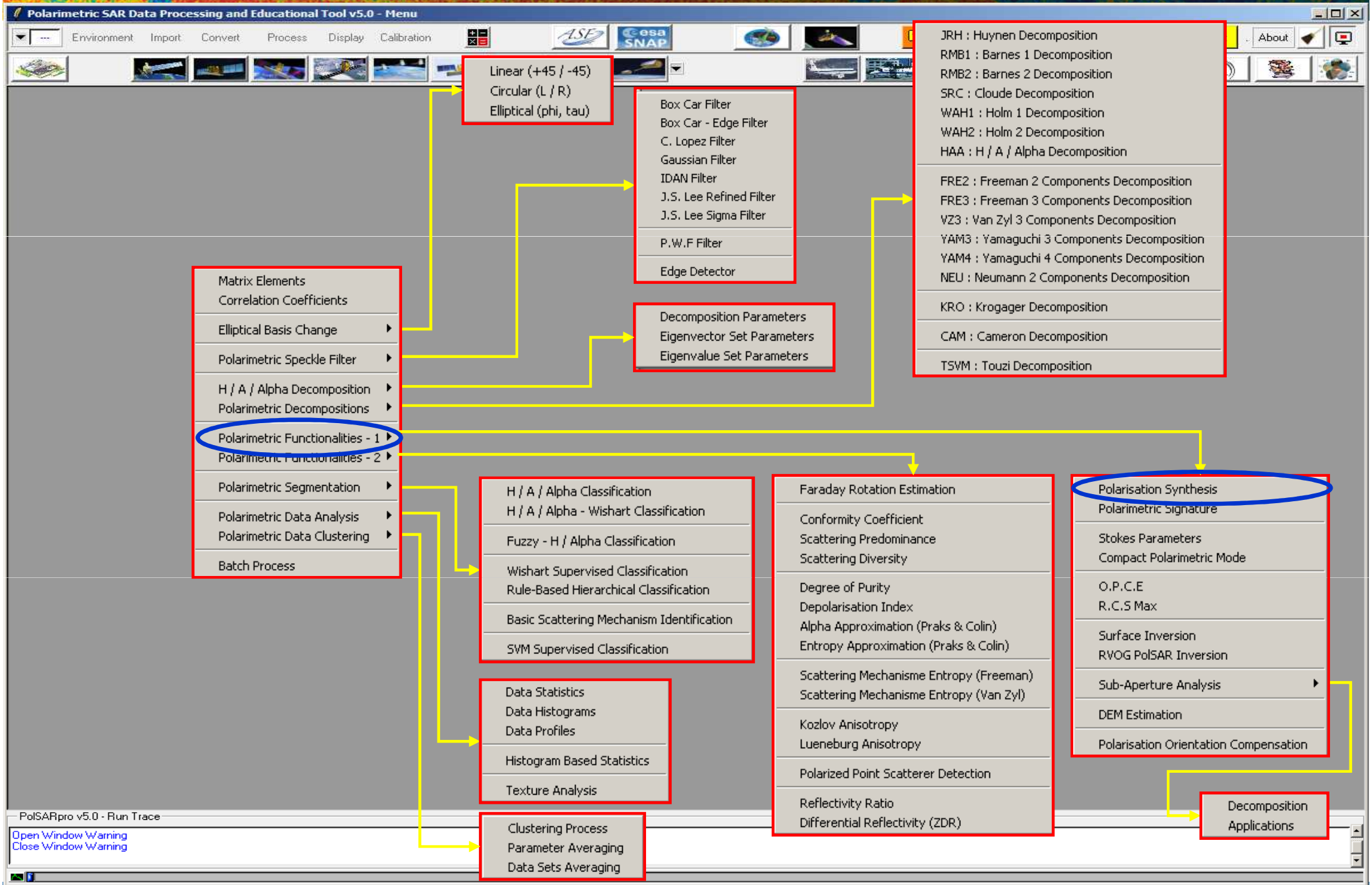




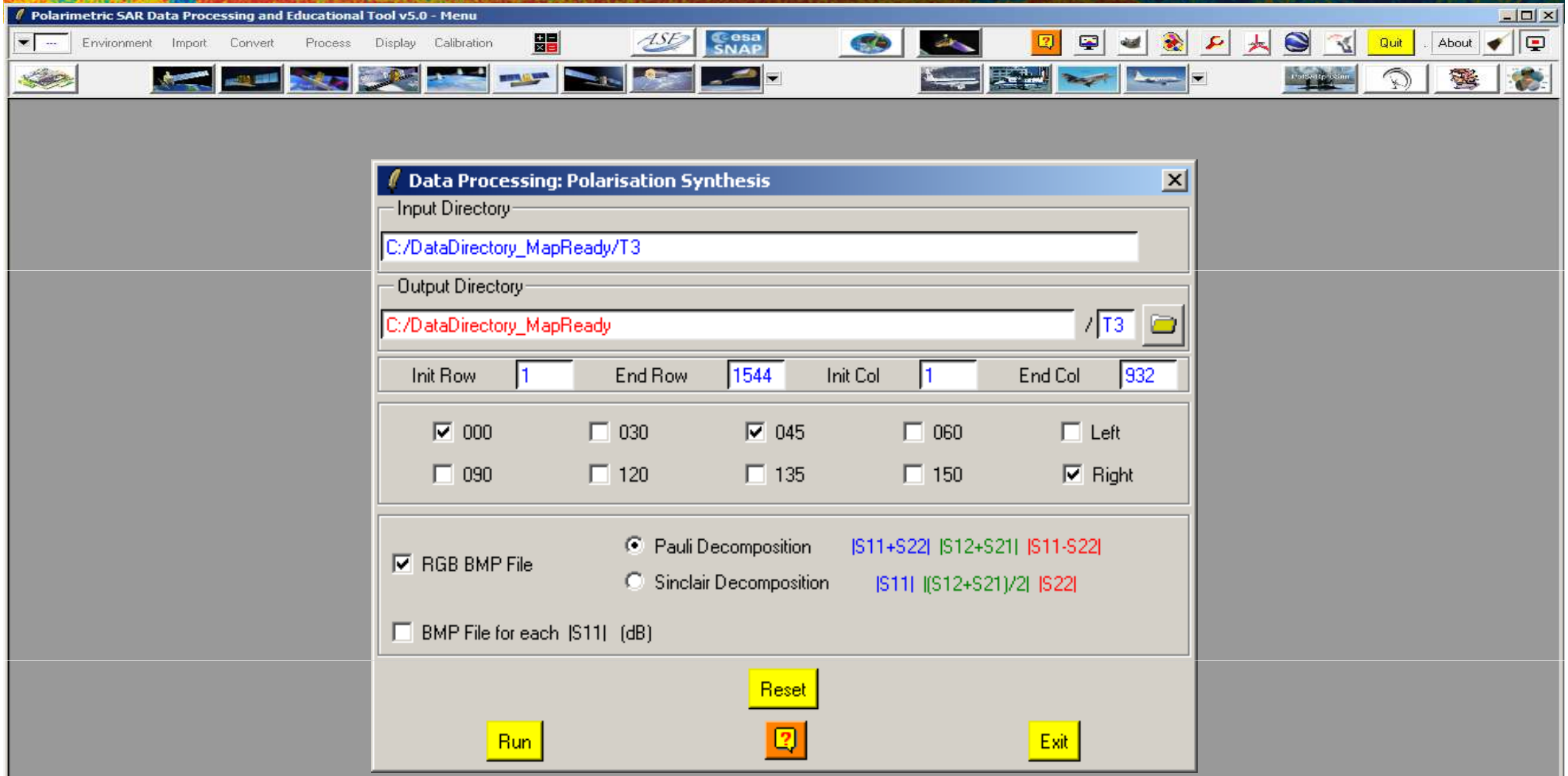
- Input Data File:
  - Spaceborne Sensors
- Extract Raw Data

- Eigenvalue Parameters
- Polarimetric Decomposition
  - Freeman
  - Van Zyl
- Polarimetric Functionalities
  - Polarimetric Synthesis
  - Polarimetric Signatures
  - Polarized Point Scatterer Detection
- Polarimetric Segmentation
  - Wishart - H / A / alpha classification
  - Supervised Wishart classification
  - Support Vector Machine Classification

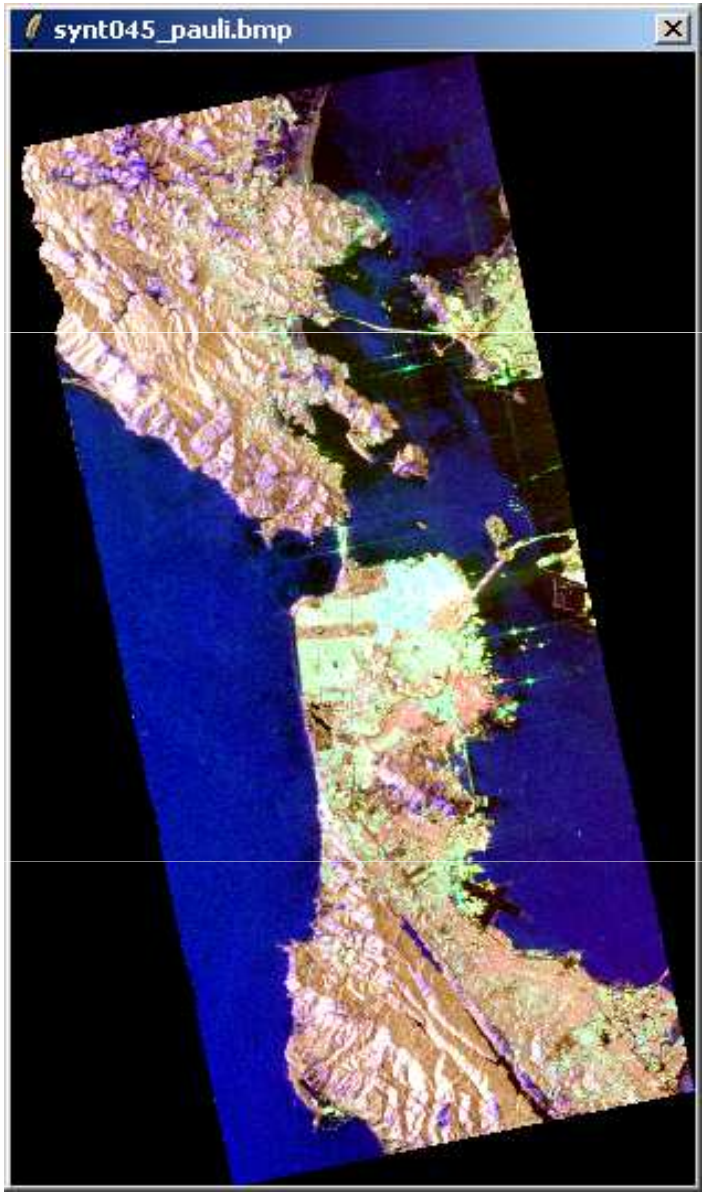
PROCESS DATA

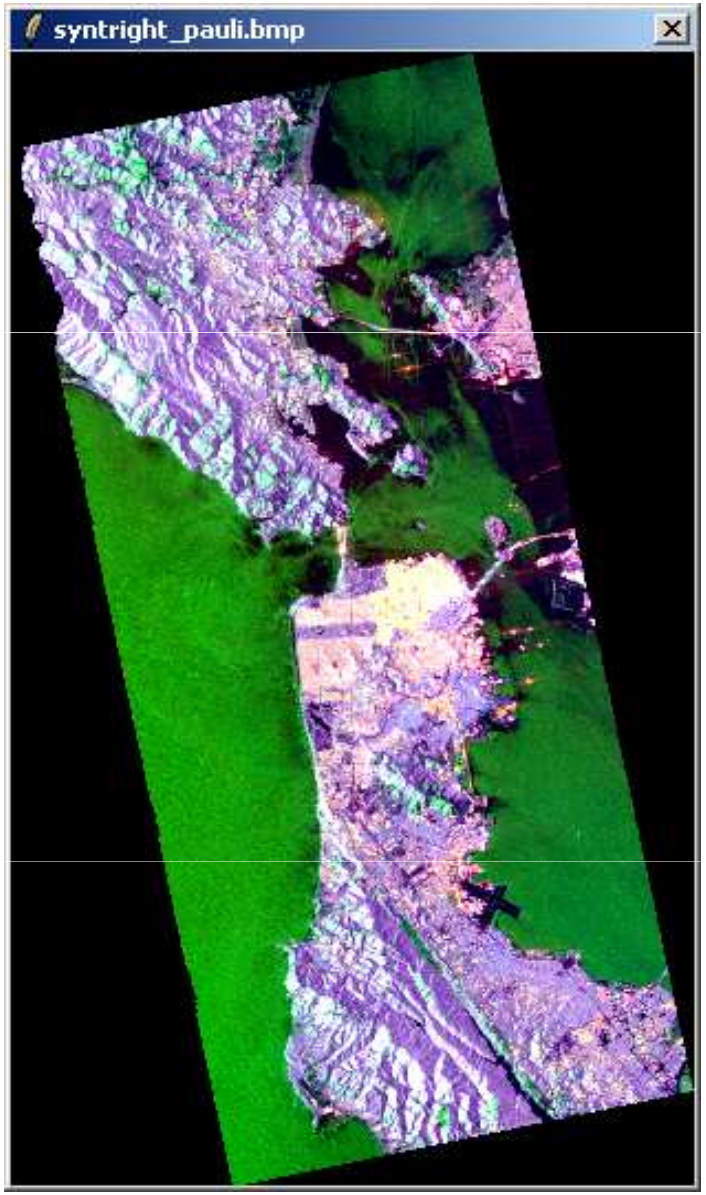


POLARIZATION SYNTHESIS

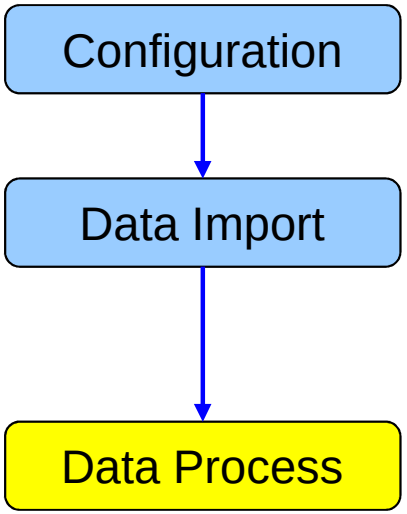


POLARIZATION SYNTHESIS





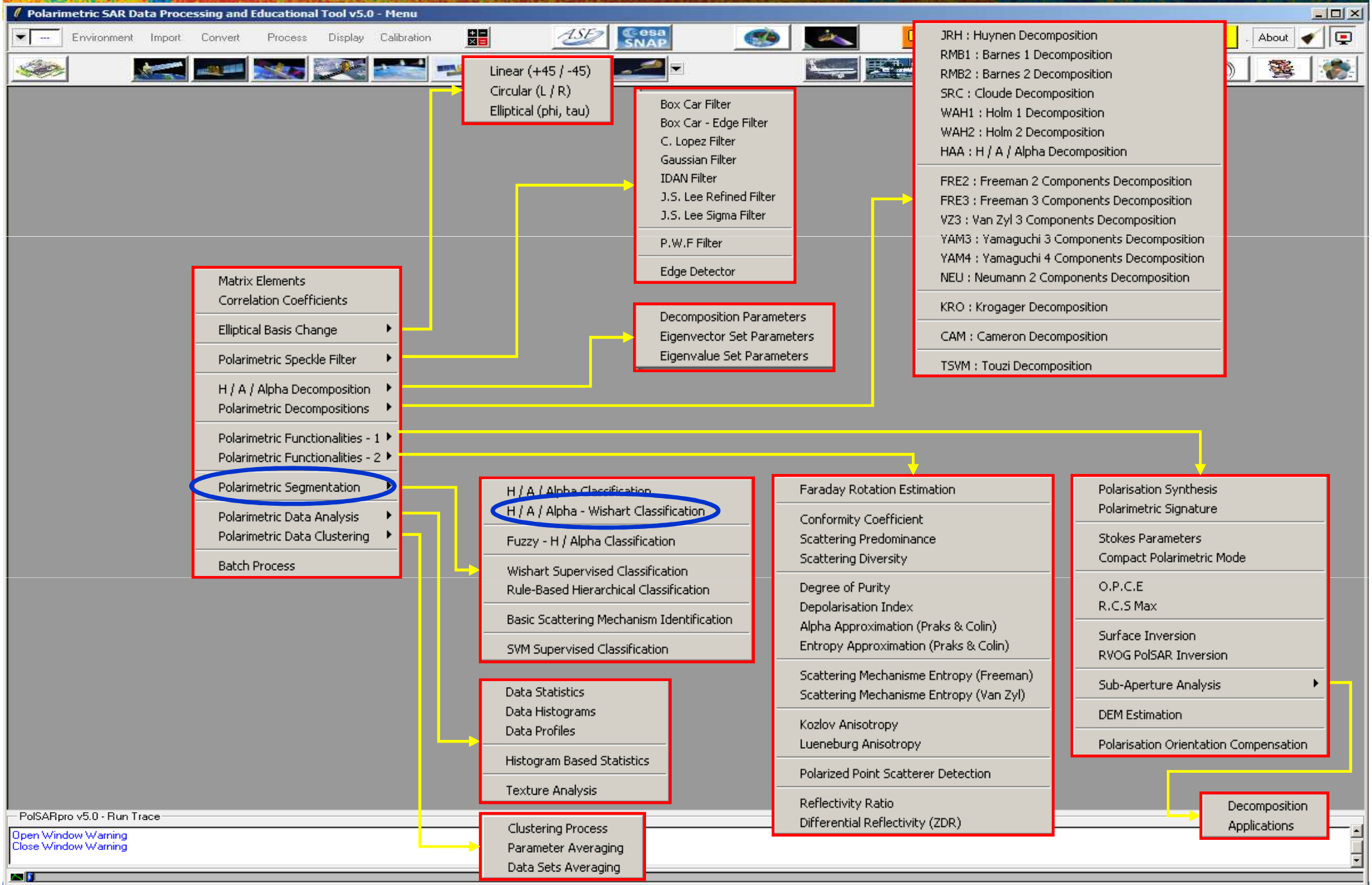
PROCESSING CHAIN



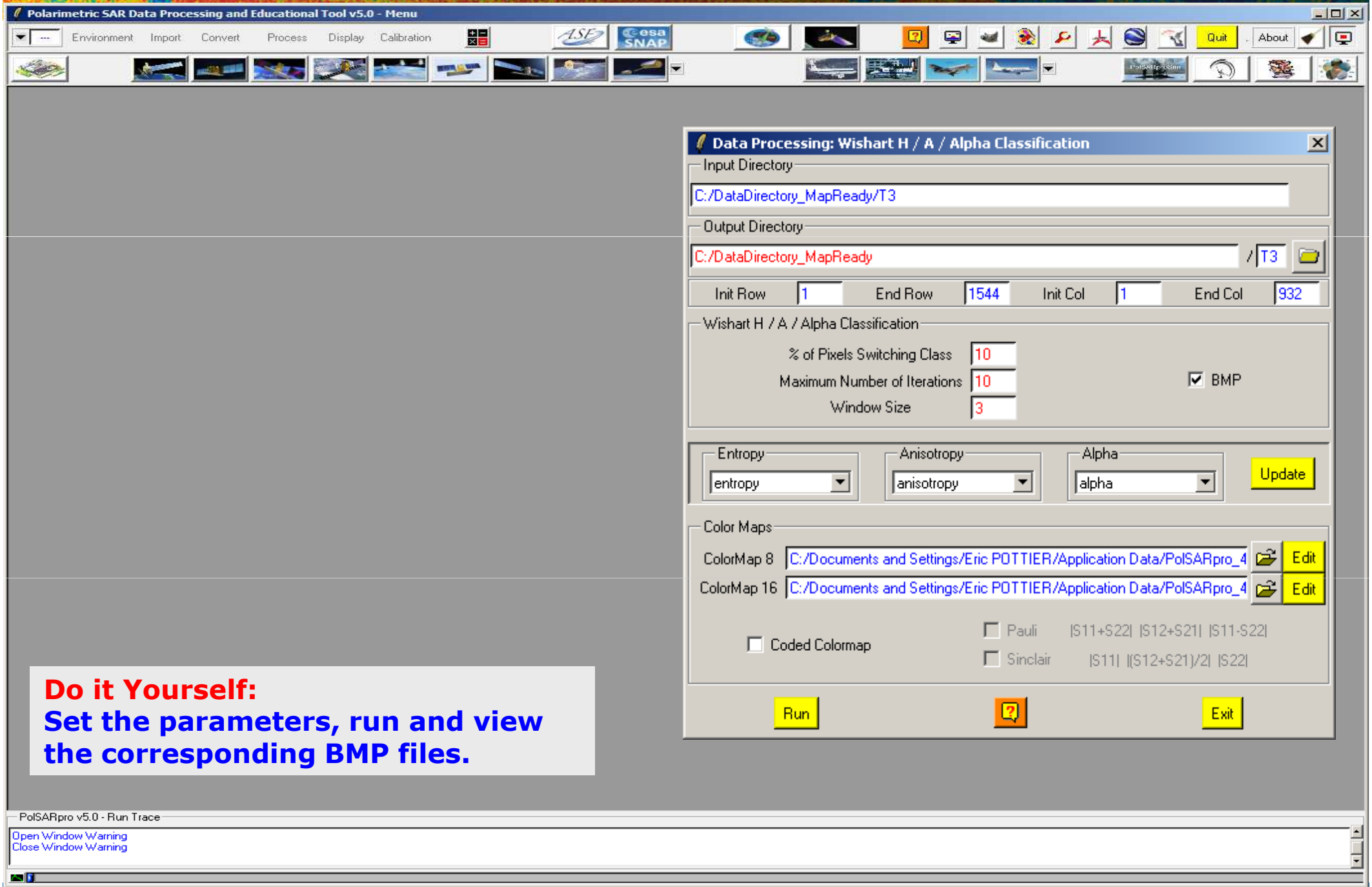
- Input Data File:
  - Spaceborne Sensors
- Extract Raw Data

- Eigenvalue Parameters
- Polarimetric Decomposition
  - Freeman
  - Van Zyl
- Polarimetric Functionalities
  - Polarimetric Synthesis
  - Polarimetric Signatures
  - Polarized Point Scatterer Detection
- Polarimetric Segmentation
  - Wishart - H / A / alpha classification
  - Supervised Wishart classification
  - Support Vector Machine Classification

PROCESS DATA

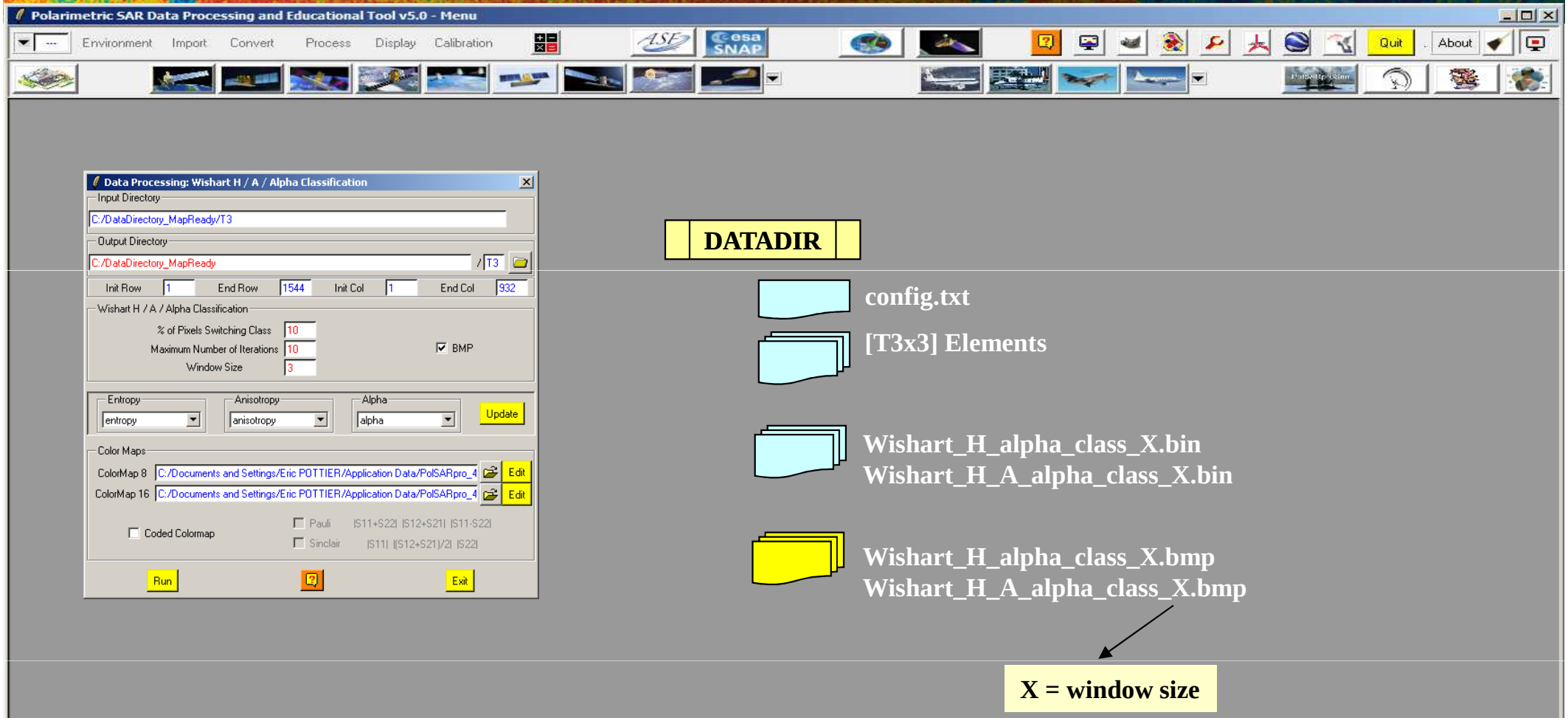


WISHART - H/A/alpha CLASSIFICATION



Do it Yourself:
Set the parameters, run and view the corresponding BMP files.

WISHART - H/A/alpha CLASSIFICATION



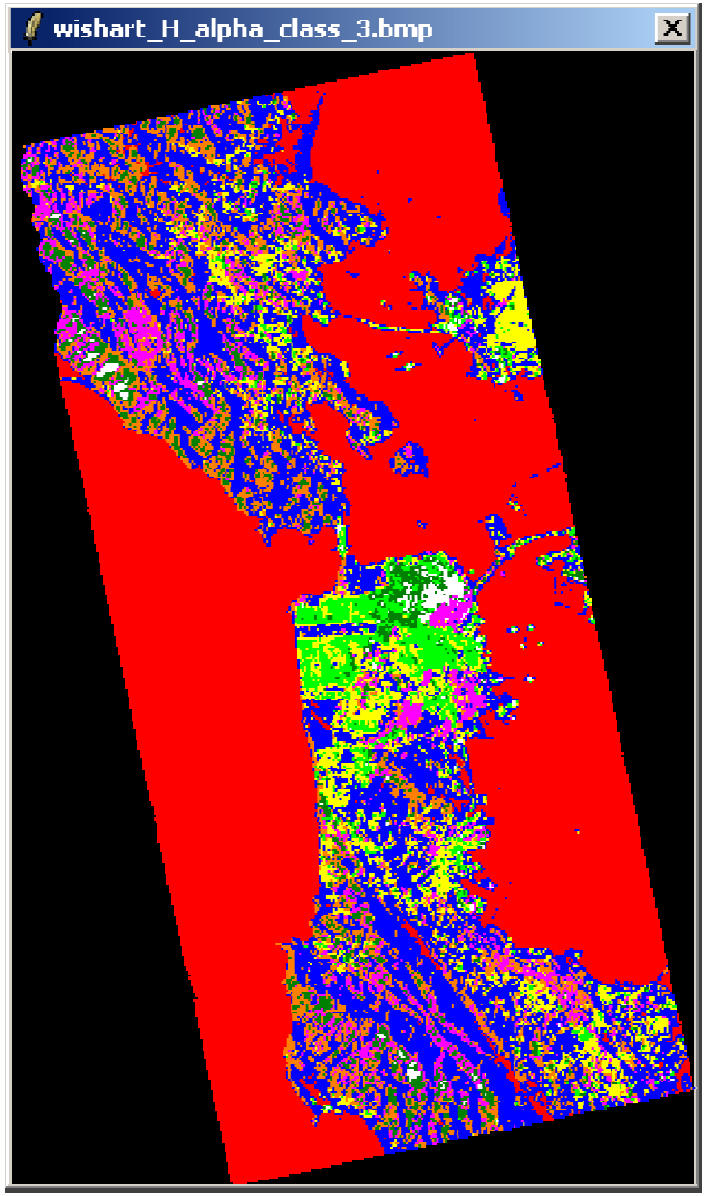
DATADIR

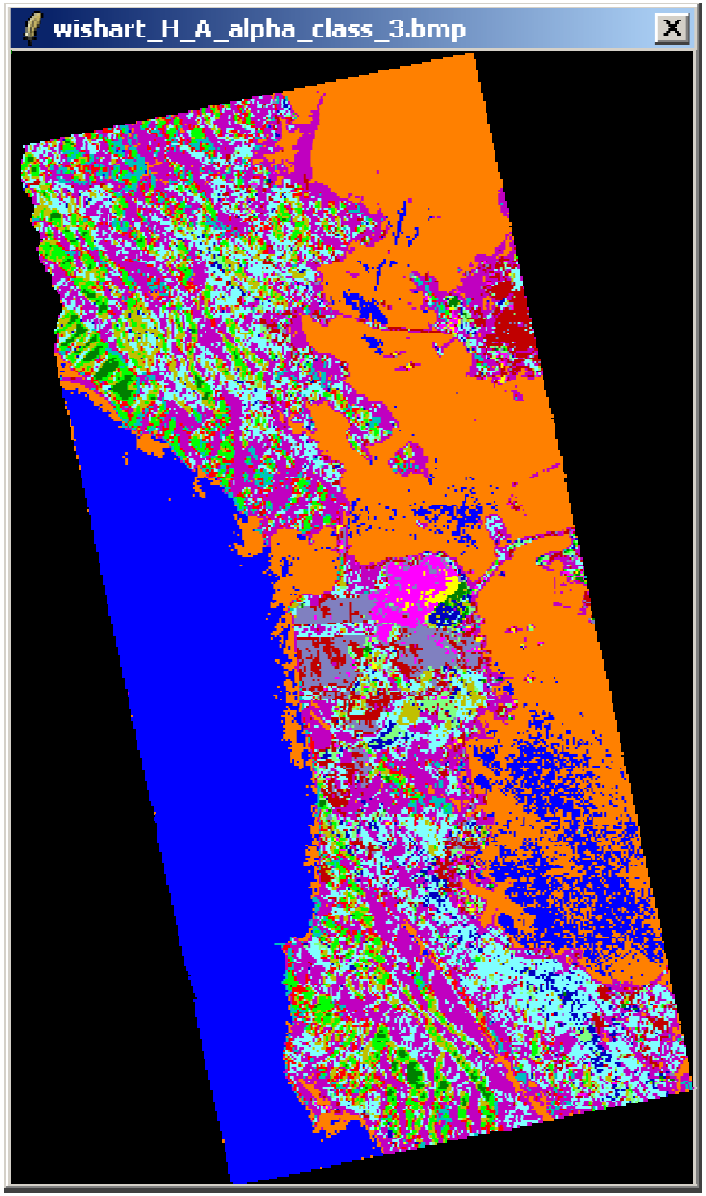
- **config.txt**
- **[T3x3] Elements**
- **Wishart_H_alpha_class_X.bin**
  Wishart_H_A_alpha_class_X.bin
- **Wishart_H_alpha_class_X.bmp**
  Wishart_H_A_alpha_class_X.bmp

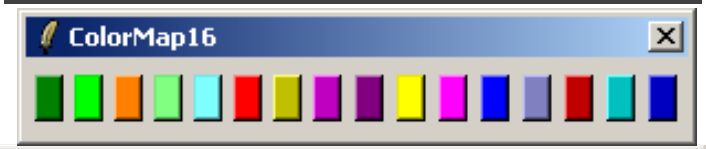
X = window size

Do it Yourself:
Set the parameters, run and view the corresponding BMP files.

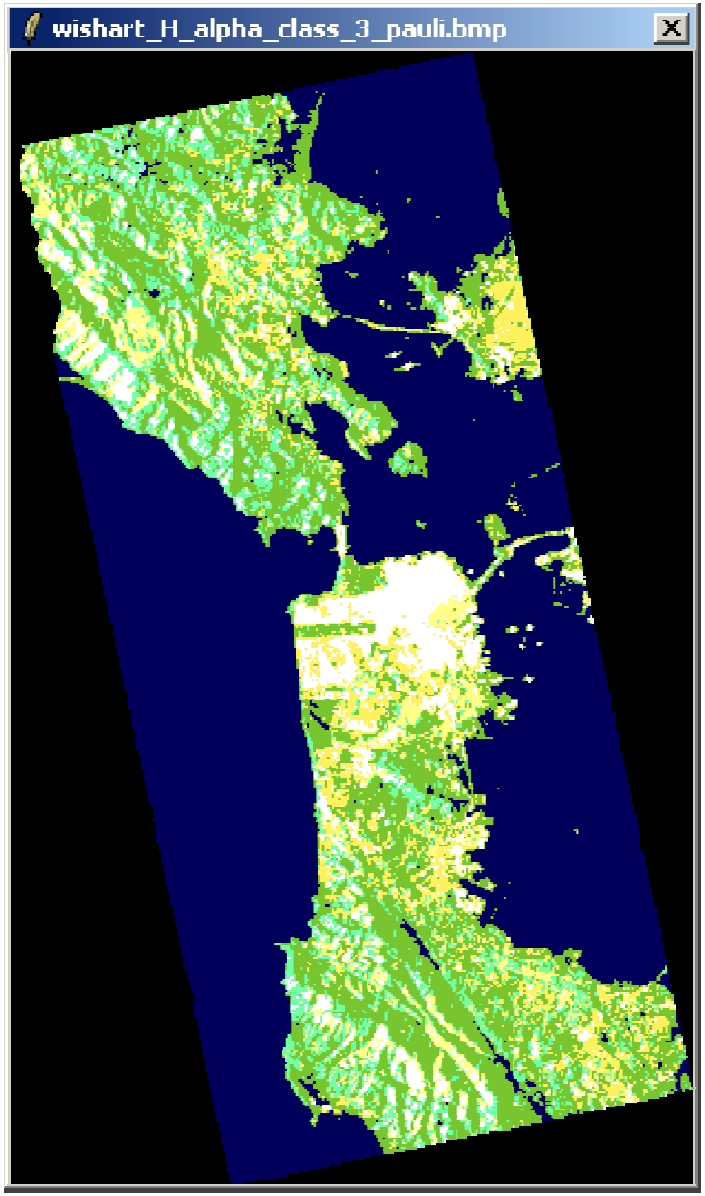
WISHART - H/A/alpha CLASSIFICATION

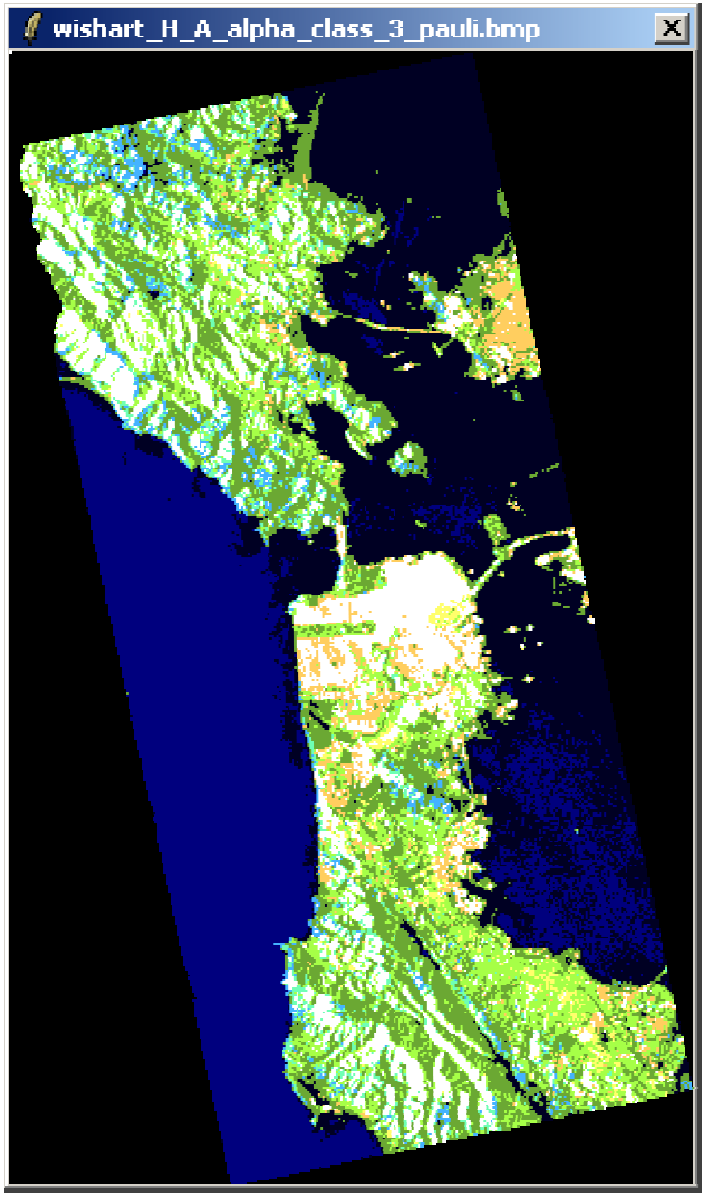




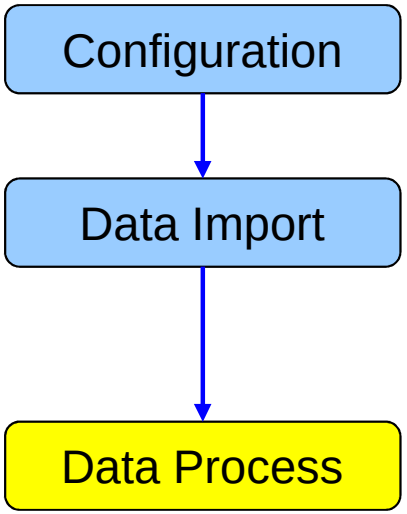


WISHART - H/A/alpha CLASSIFICATION





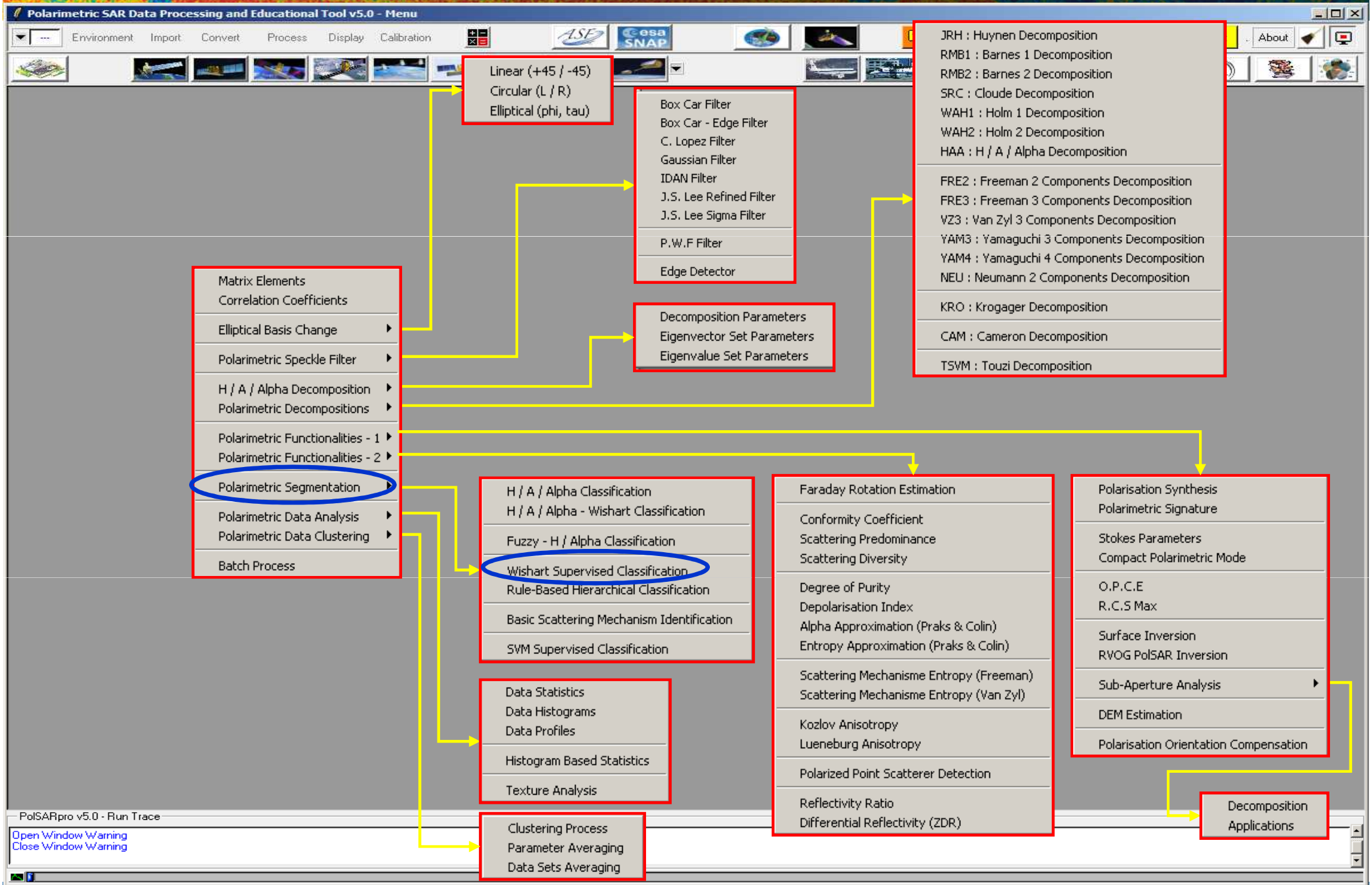
PROCESSING CHAIN



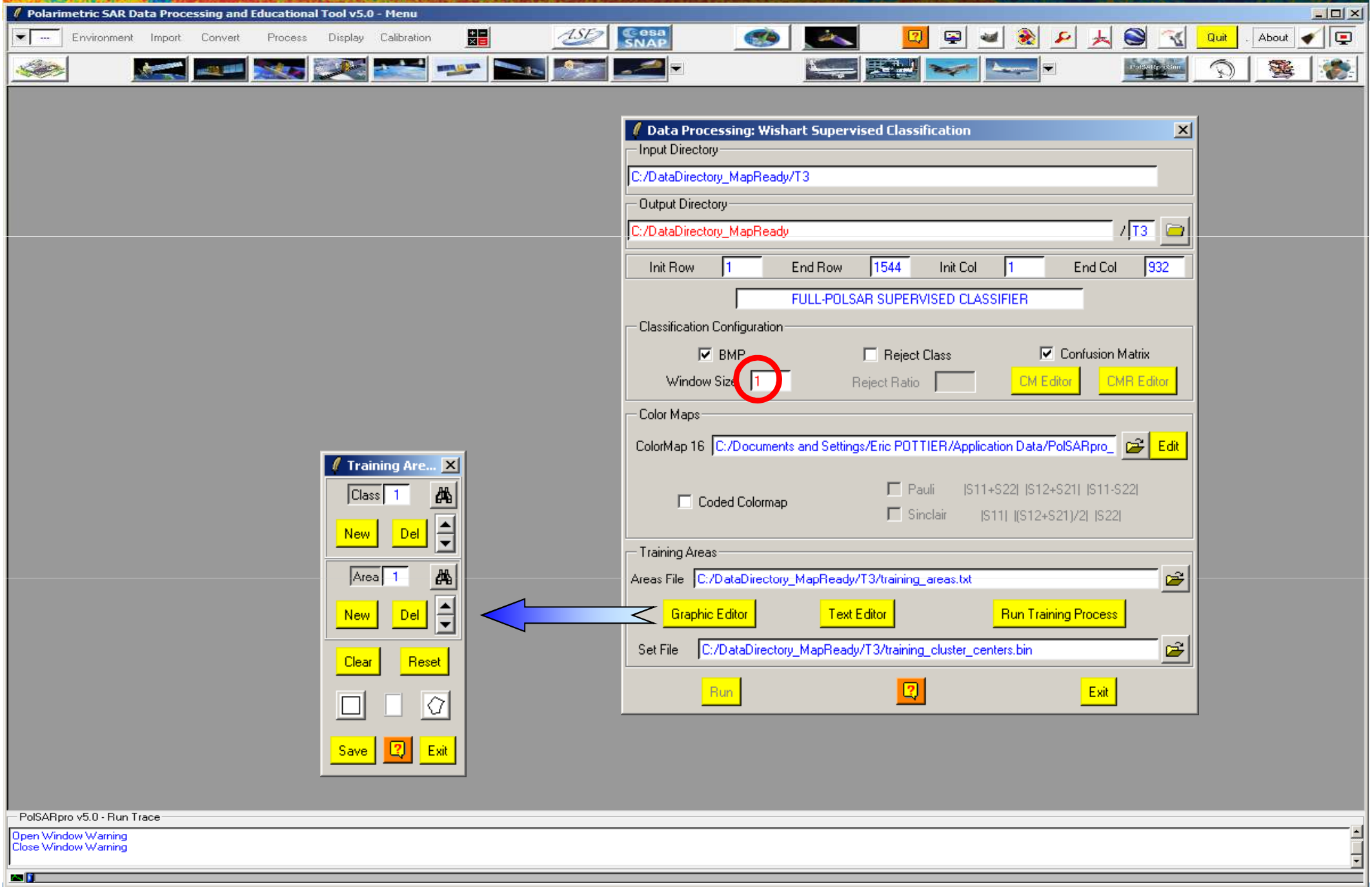
- Input Data File:
  - Spaceborne Sensors
- Extract Raw Data

- Eigenvalue Parameters
- Polarimetric Decomposition
  - Freeman
  - Van Zyl
- Polarimetric Functionalities
  - Polarimetric Synthesis
  - Polarimetric Signatures
  - Polarized Point Scatterer Detection
- Polarimetric Segmentation
  - Wishart - H / A / alpha classification
  - Supervised Wishart classification
  - Support Vector Machine Classification

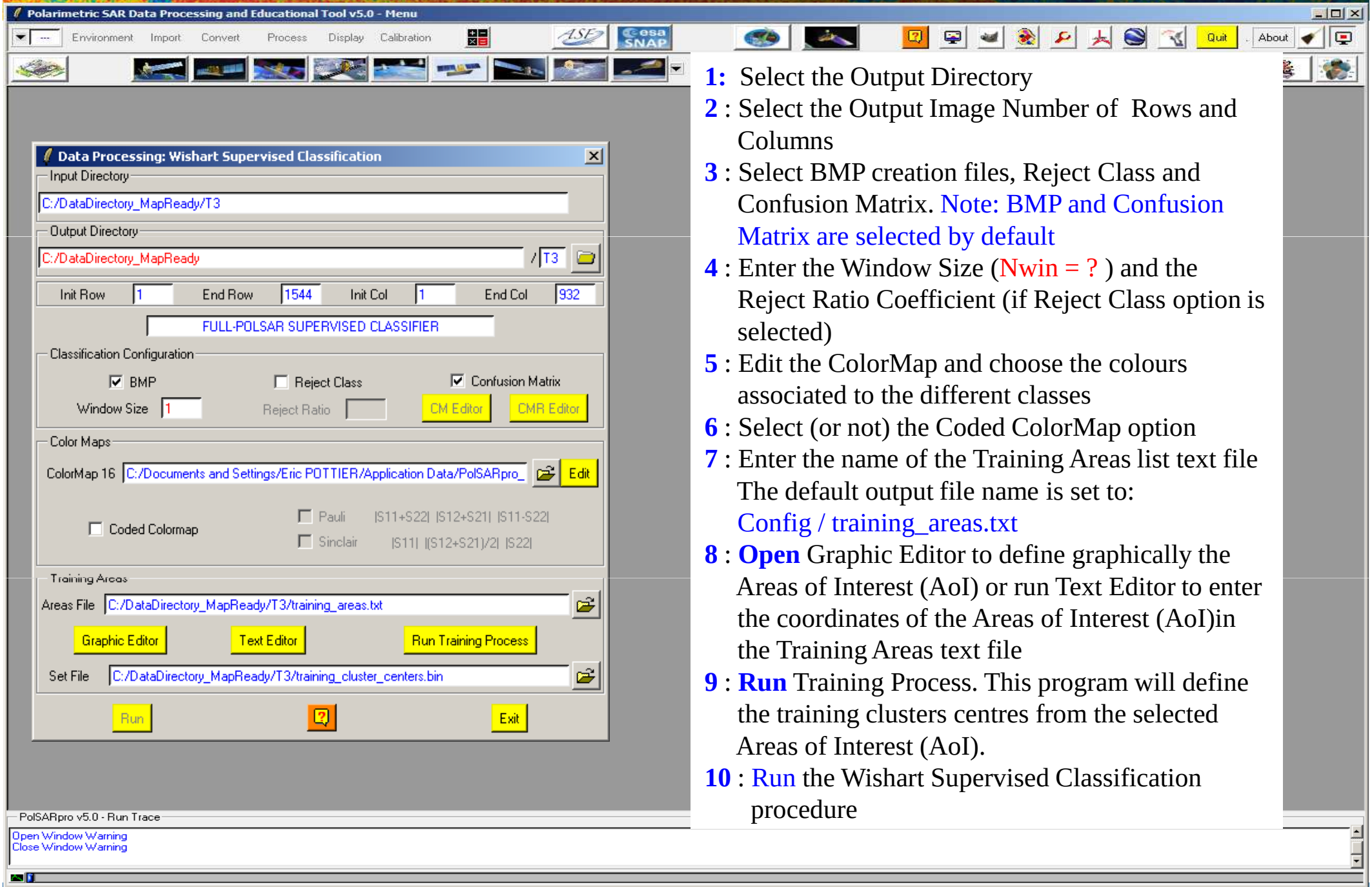
PROCESS DATA



SUPERVISED CLASSIFICATION



SUPERVISED CLASSIFICATION



1: Select the Output Directory

2 : Select the Output Image Number of Rows and Columns

3 : Select BMP creation files, Reject Class and Confusion Matrix. Note: BMP and Confusion Matrix are selected by default

4 : Enter the Window Size (Nwin = ?) and the Reject Ratio Coefficient (if Reject Class option is selected)

5 : Edit the ColorMap and choose the colours associated to the different classes

6 : Select (or not) the Coded ColorMap option

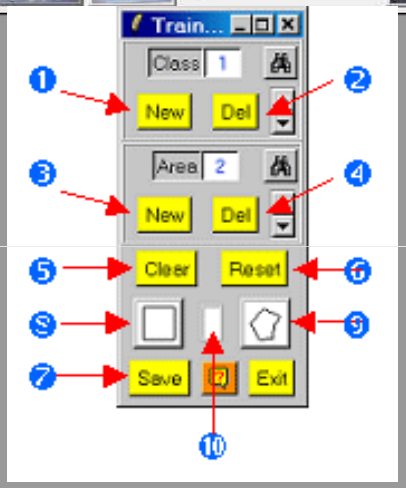
7 : Enter the name of the Training Areas list text file The default output file name is set to: Config / training_areas.txt

8 : **Open** Graphic Editor to define graphically the Areas of Interest (AoI) or run Text Editor to enter the coordinates of the Areas of Interest (AoI)in the Training Areas text file

9 : **Run** Training Process. This program will define the training clusters centres from the selected Areas of Interest (AoI).

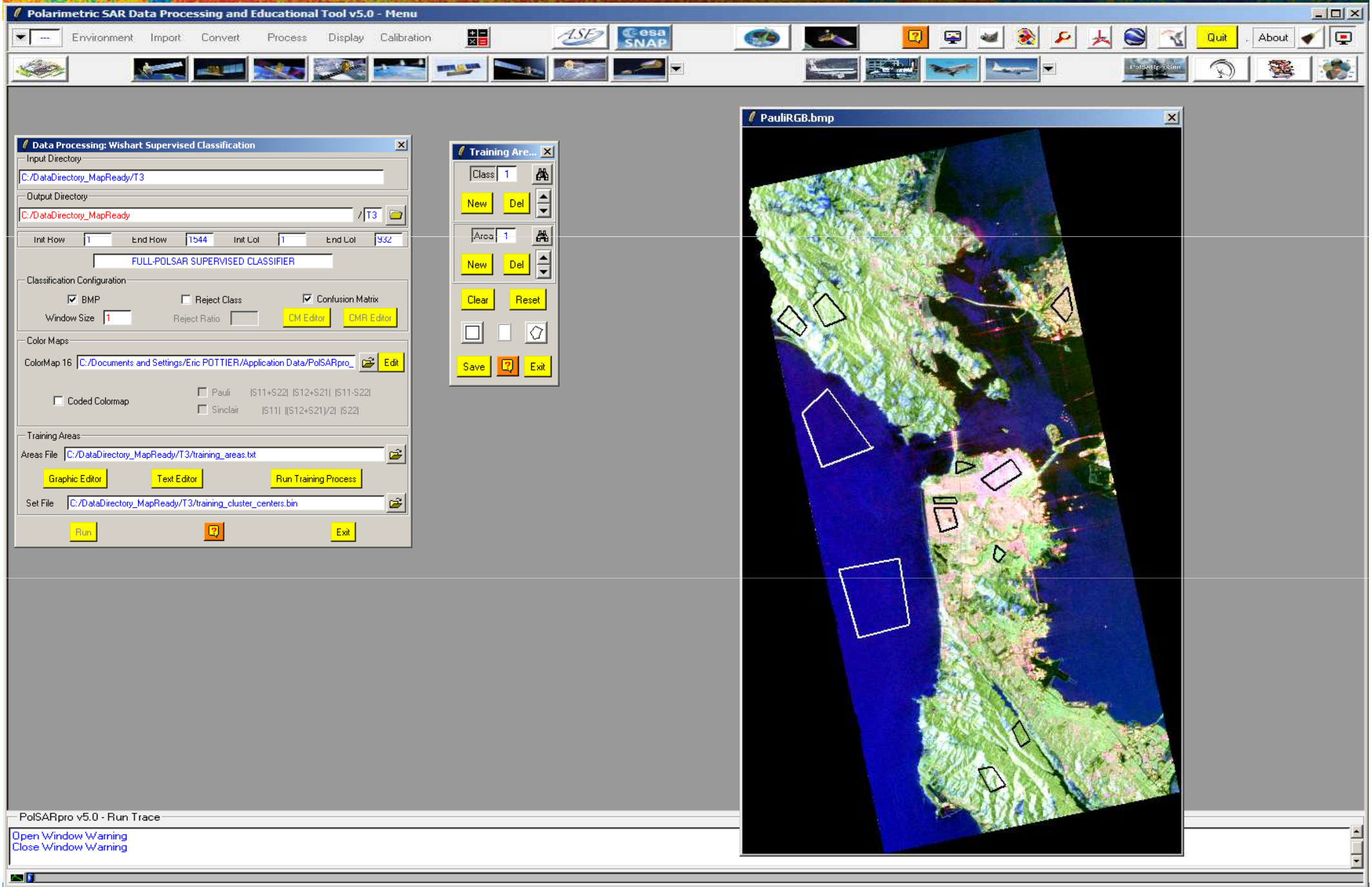
10 : Run the Wishart Supervised Classification procedure

SUPERVISED CLASSIFICATION

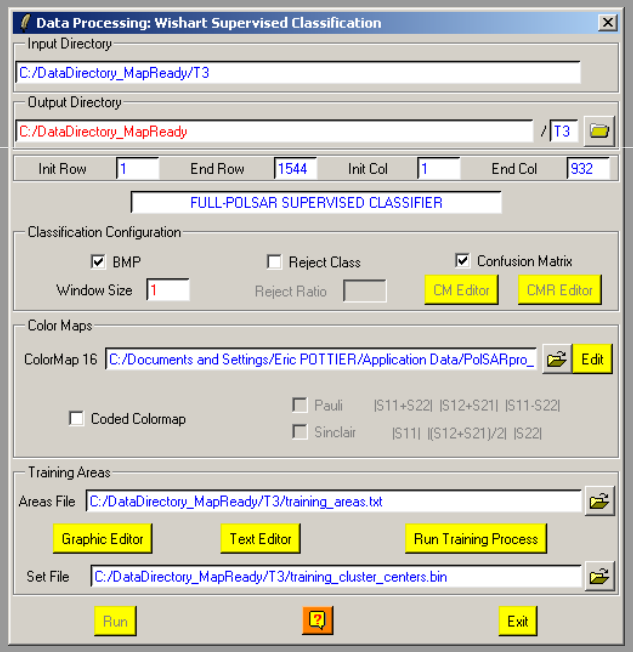


- **1** : Create a new Training Class and add it to the list.
- **2** : Delete the current Training Class from the list.
- **3** : Create a new Training Area and add it to the list of the current Training Class.
- **4** : Delete the current Training Area from the list.
- **5** : Clear the different contours on the chosen image.
- **6** : Delete all the Training Classes and associated Training Areas from the list.
- **7** : Save the Training Class and associated Training Areas list.
  The default output file name is set to MD / training_areas.txt.
- **8** : Rectangular selection of Area of Interest (AoI).
- **9** : Polygonal selection of Area of Interest (AoI).
  Note: The contour is automatically closed by clicking on the Mouse Right Button.
- **10** : Toggle selected area contour color (black / white).
- Class : Redraw all the Training Areas of the current Training Class.
- Class : Move in the up/down direction in the Training Class list.
- Area : Redraw the current Training Area of the current Training Class.
- Area : Move in the up/down direction in the Training Area list of the current Training Class.

SUPERVISED CLASSIFICATION



SUPERVISED CLASSIFICATION



DATADIR

config.txt

[T3x3] Elements

Run Training Process ← Training_areas.txt

Training_areas.bin

Training_cluster_set.bmp

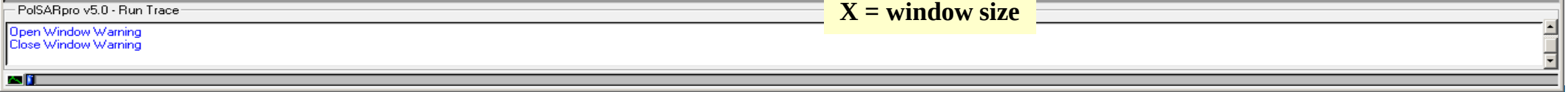
Run Classification

Supervised_class_X.bin
Supervised_class_rej_X.bin
Confusion_matrix_X.txt
Confusion_matrix_rej_X.txt

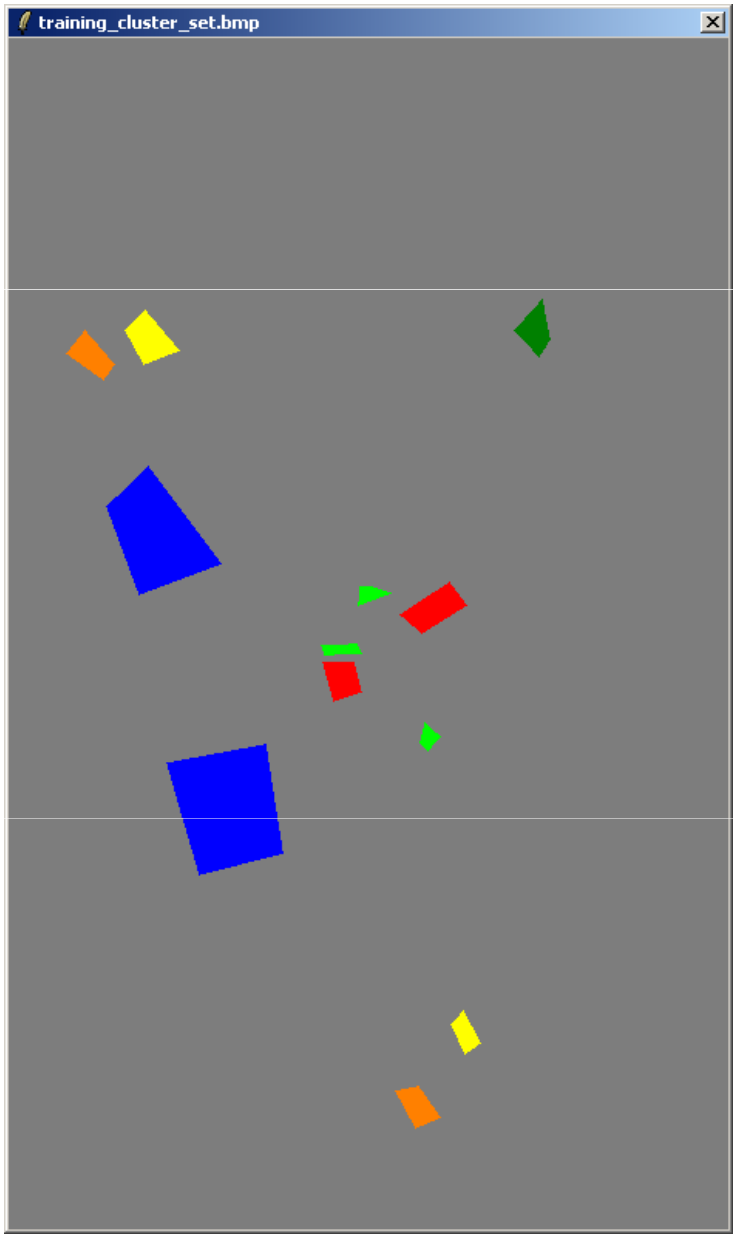
Supervised_class_X.bmp
Supervised_class_rej_X.bmp
Classified_cluster_set.bmp
Classified_cluster_set_rej.bmp

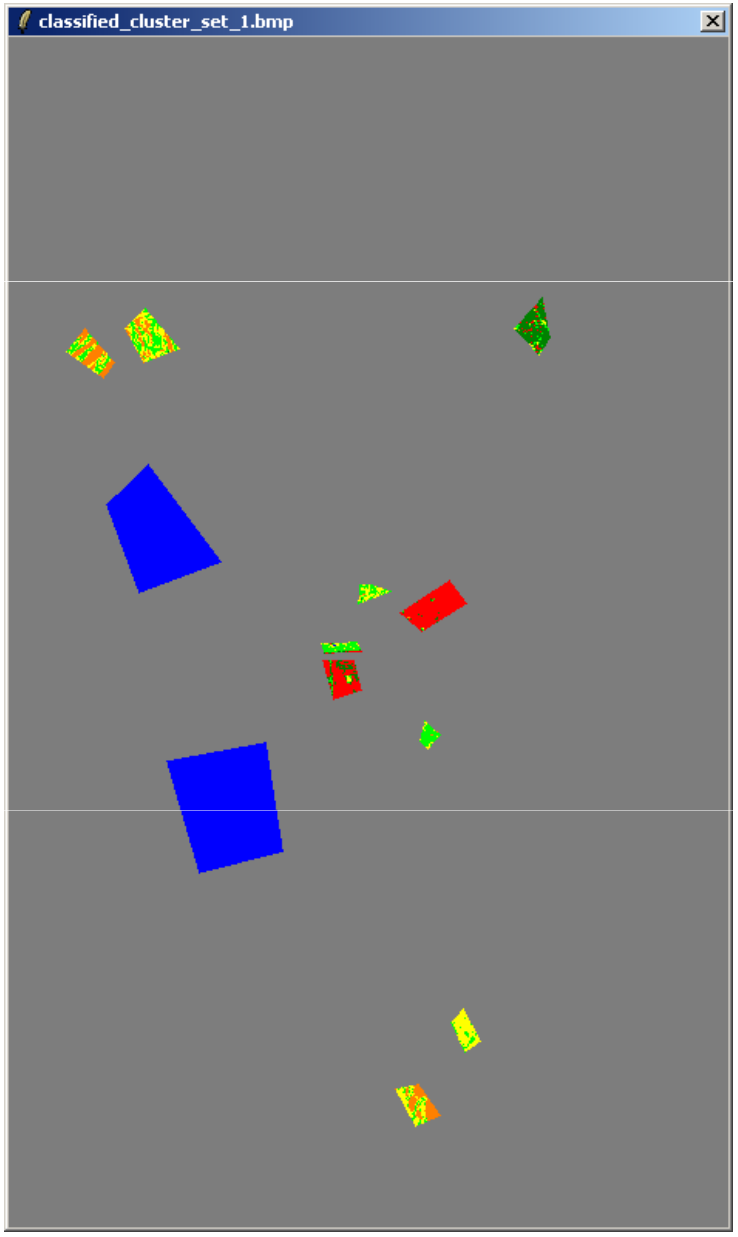
X = window size

Do it Yourself:
Set the parameters, select different classes, run and view the corresponding BMP files.

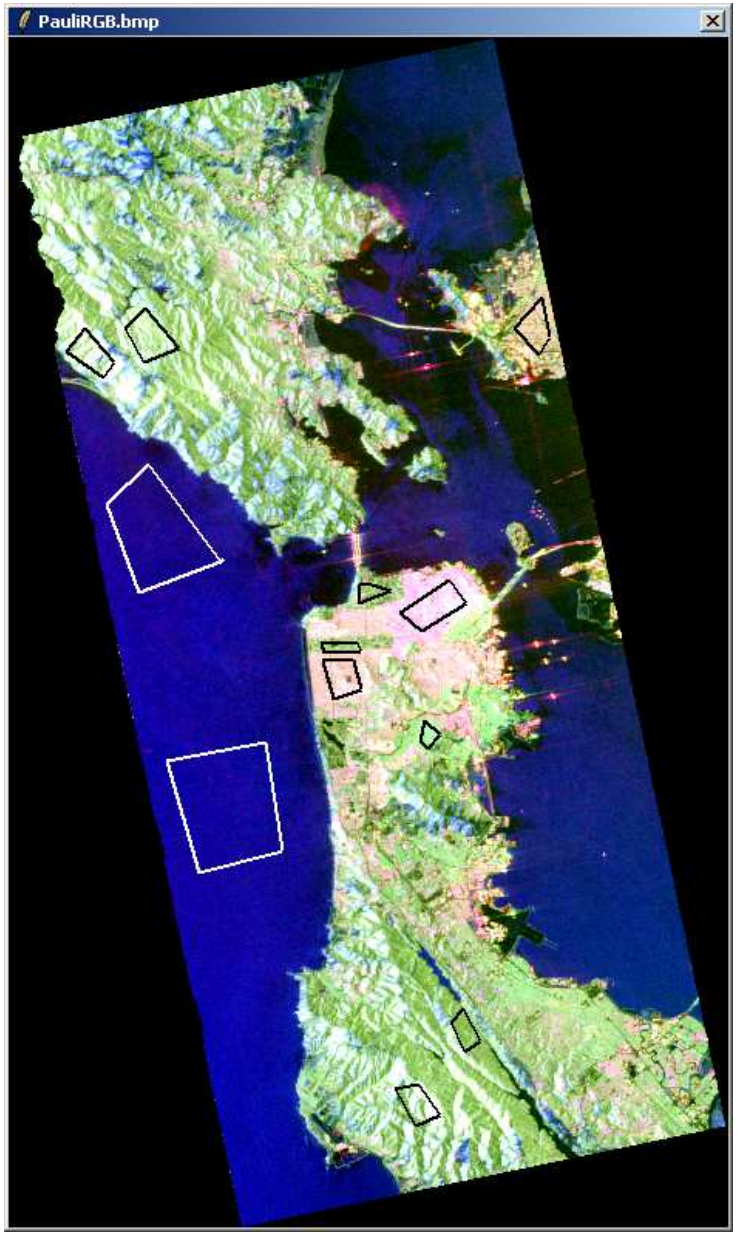


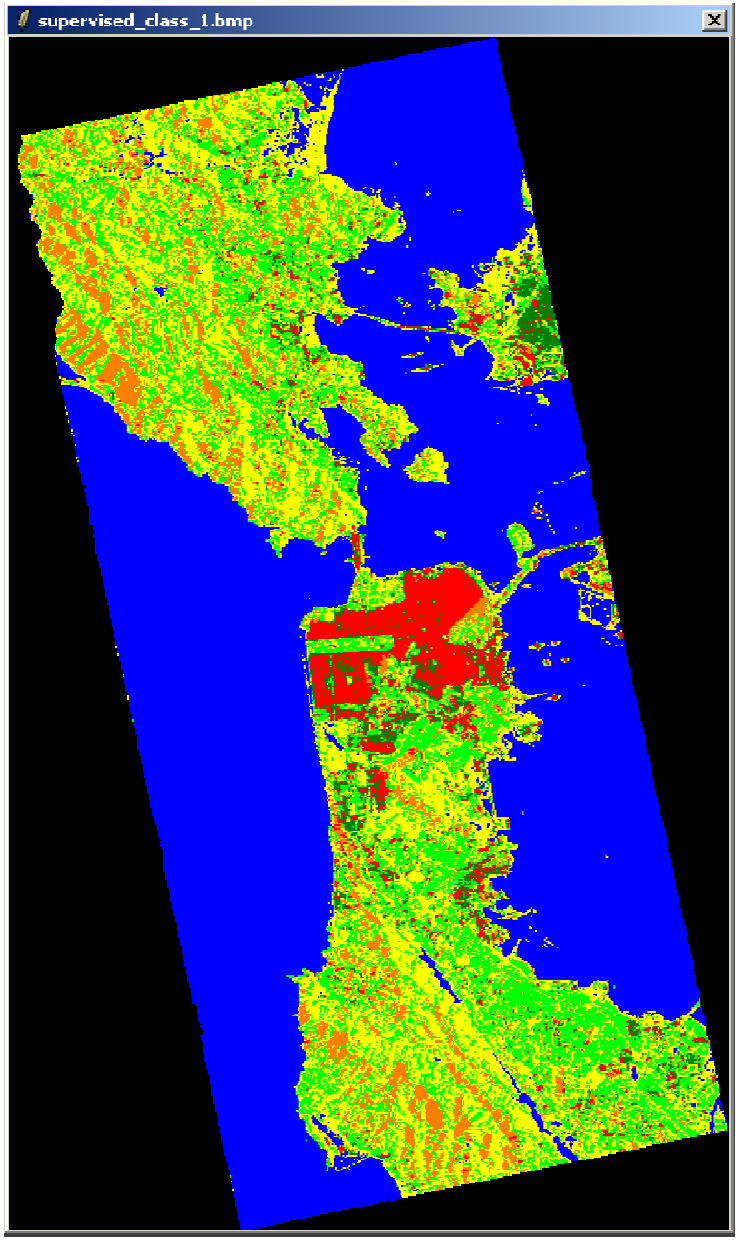
SUPERVISED CLASSIFICATION



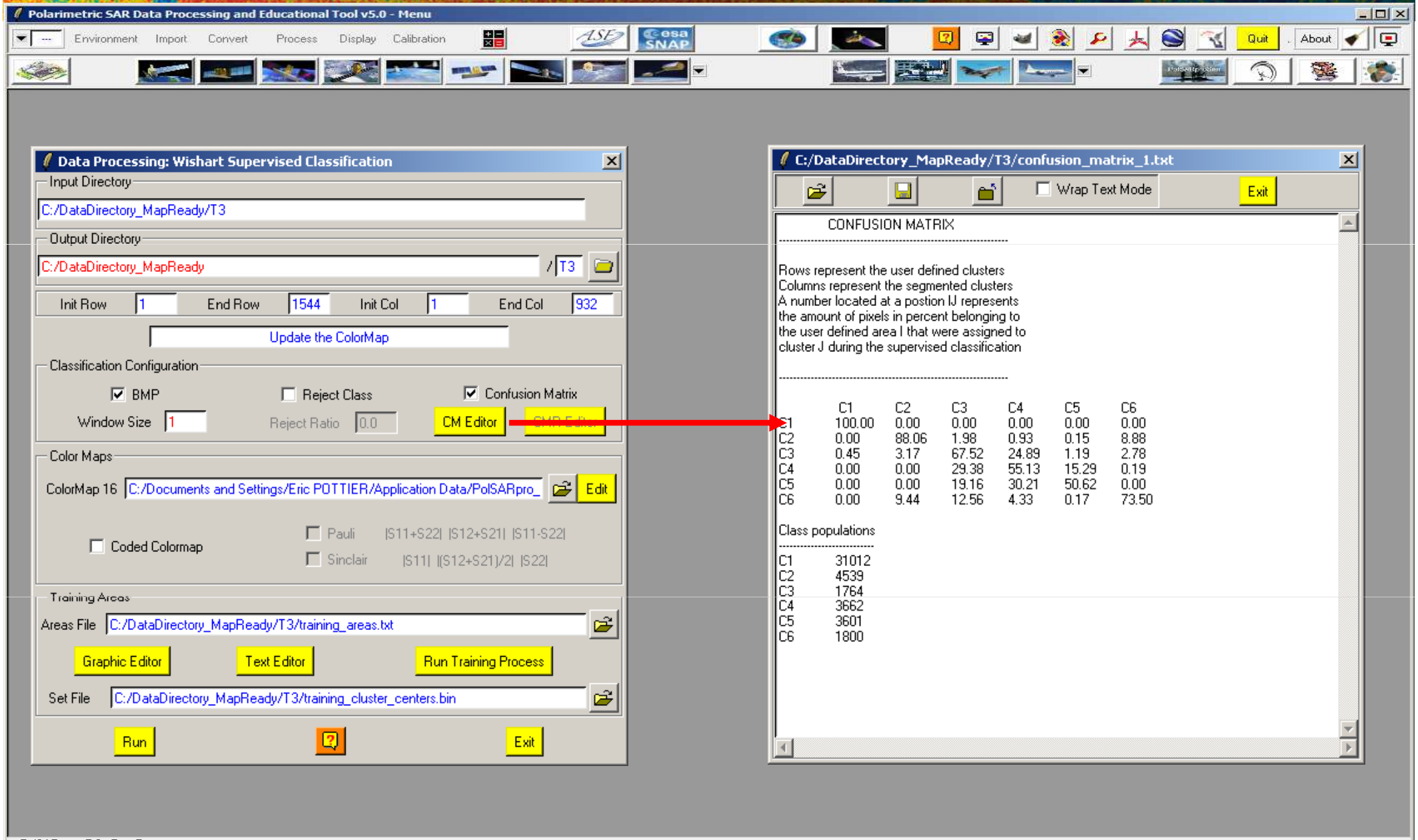


SUPERVISED CLASSIFICATION

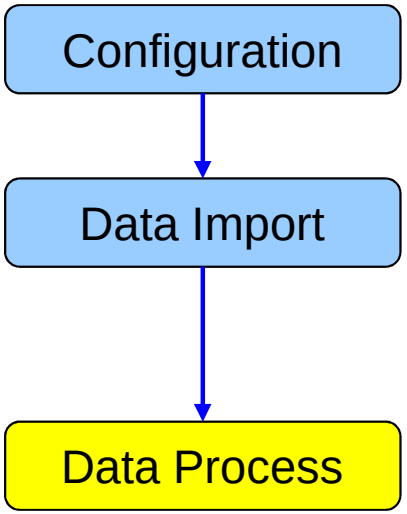




SUPERVISED CLASSIFICATION



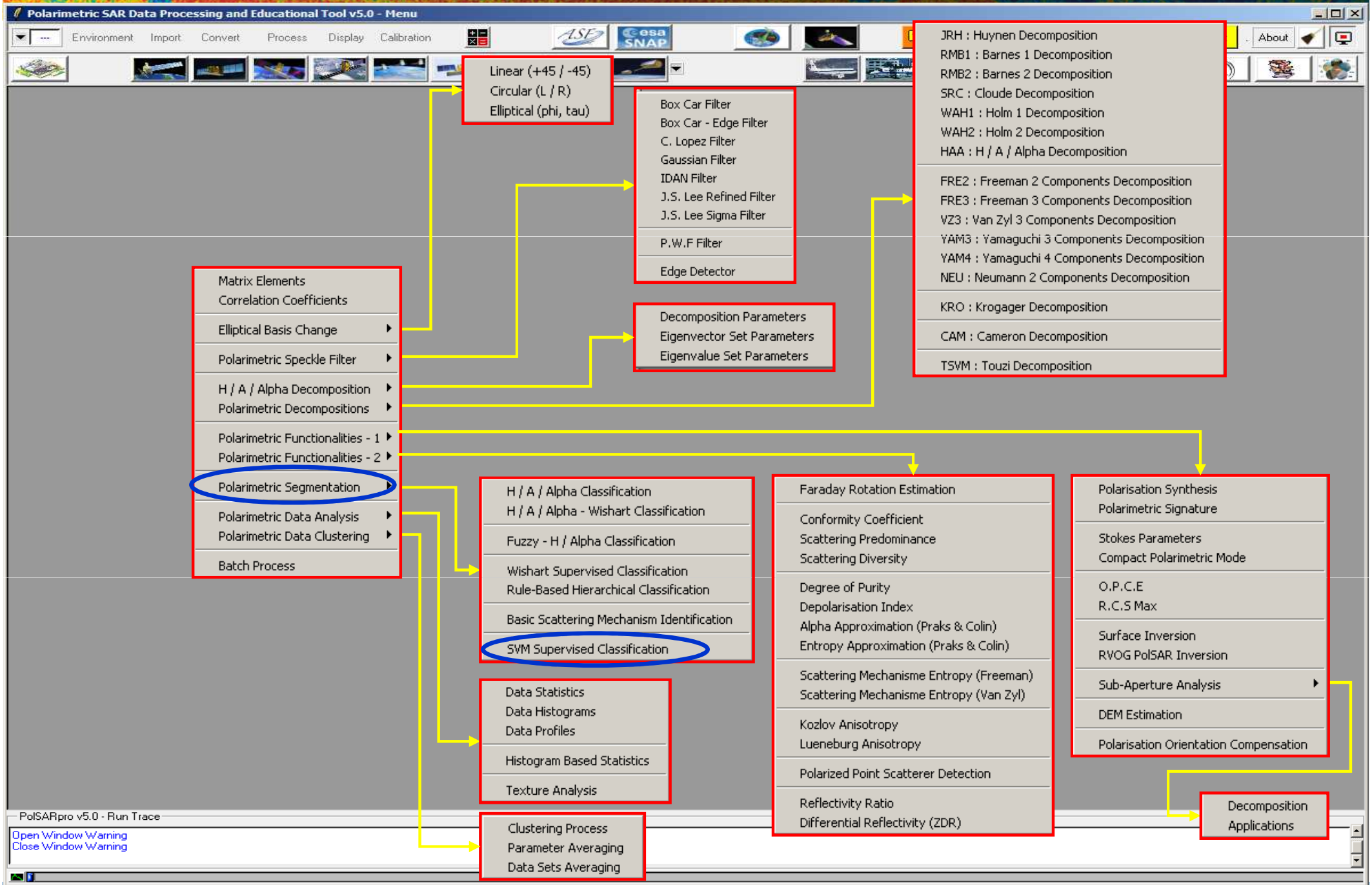
PROCESSING CHAIN



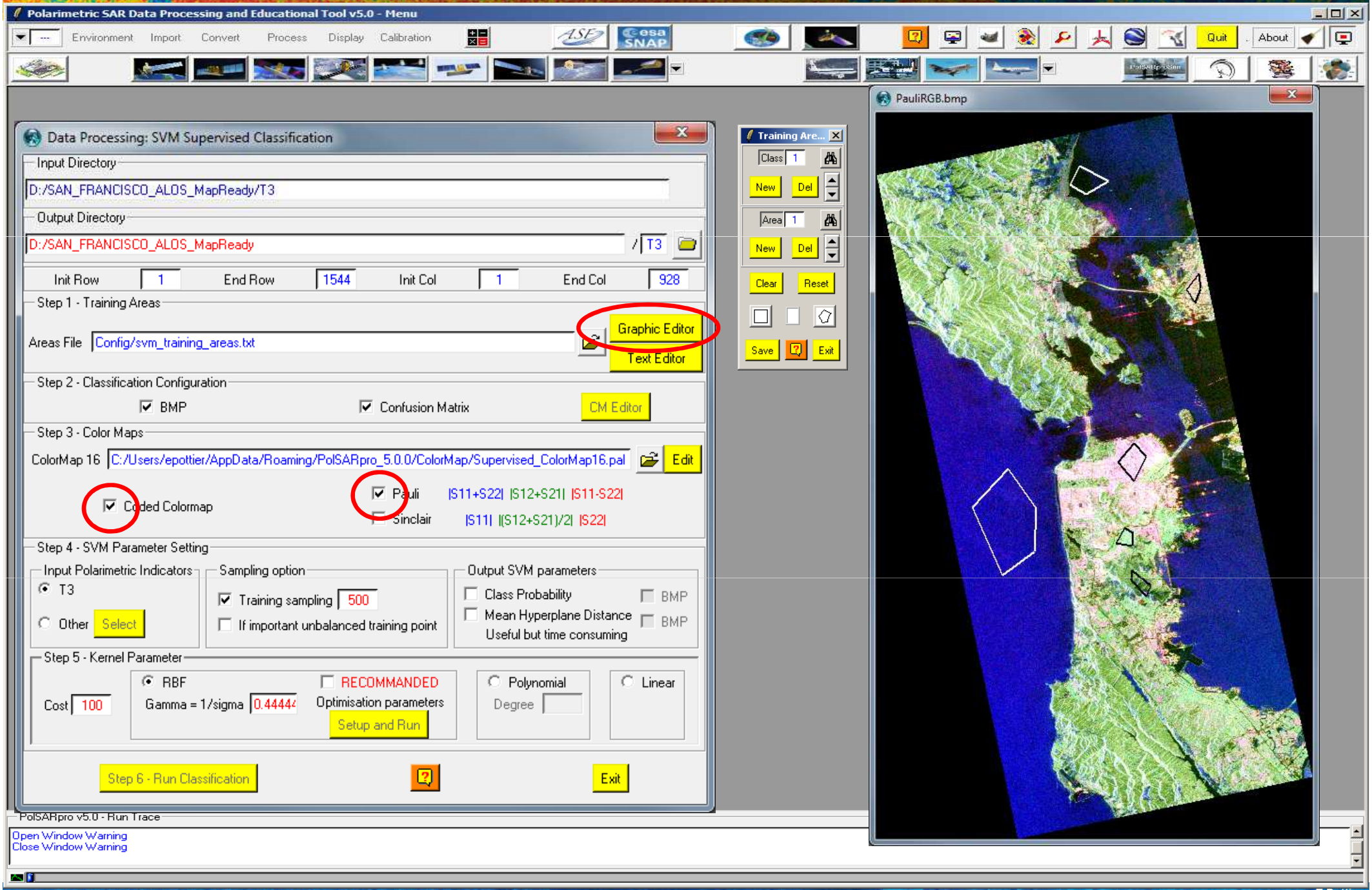
- Input Data File:
  - Spaceborne Sensors
- Extract Raw Data

- Eigenvalue Parameters
- Polarimetric Decomposition
  - Freeman
  - Van Zyl
- Polarimetric Functionalities
  - Polarimetric Synthesis
  - Polarimetric Signatures
  - Polarized Point Scatterer Detection
- Polarimetric Segmentation
  - Wishart - H / A / alpha classification
  - Supervised Wishart classification
  - Support Vector Machine Classification

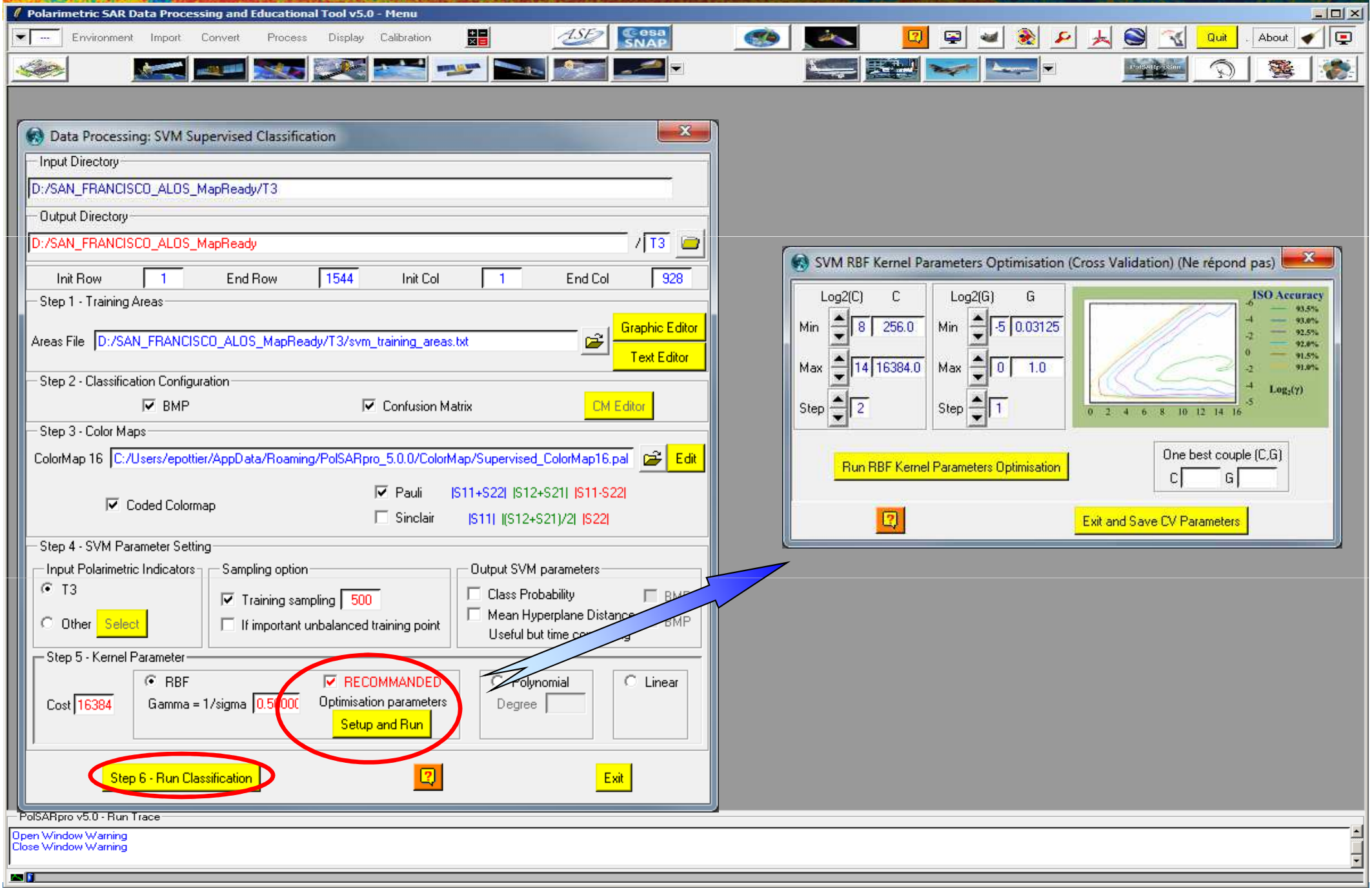
PROCESS DATA



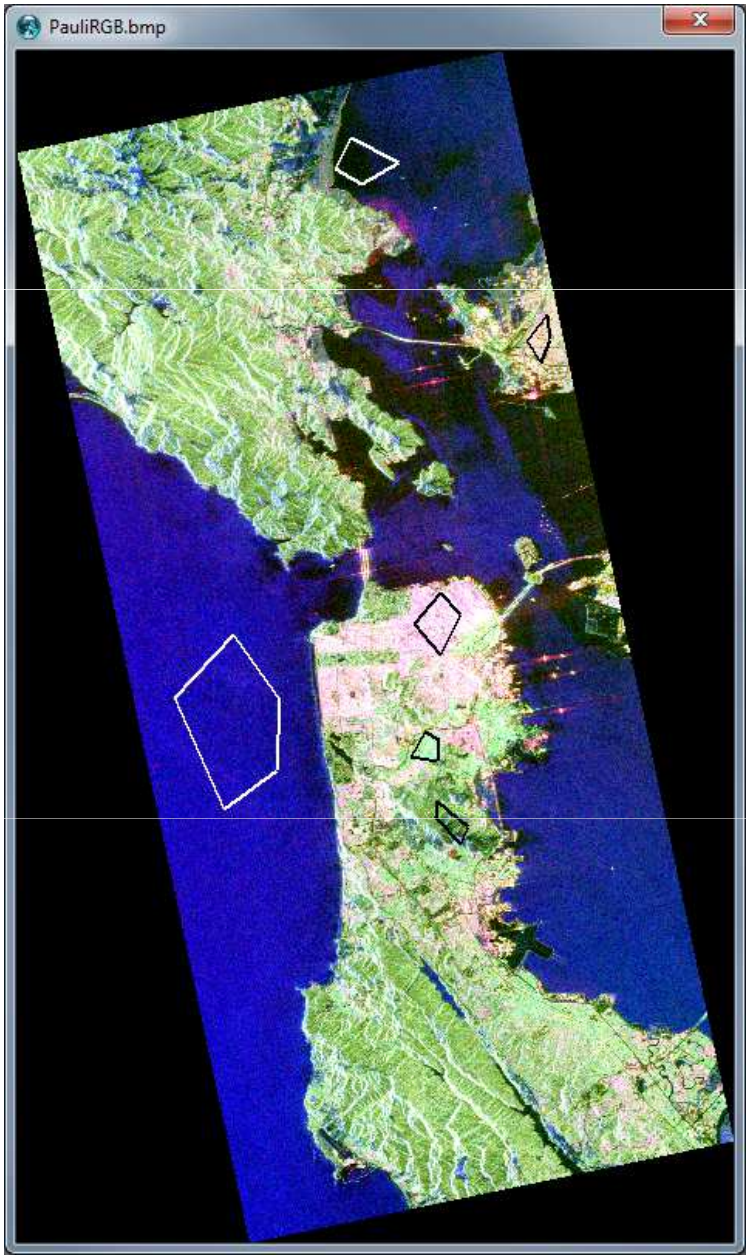
SUPPORT VECTOR MACHINE CLASSIFICATION

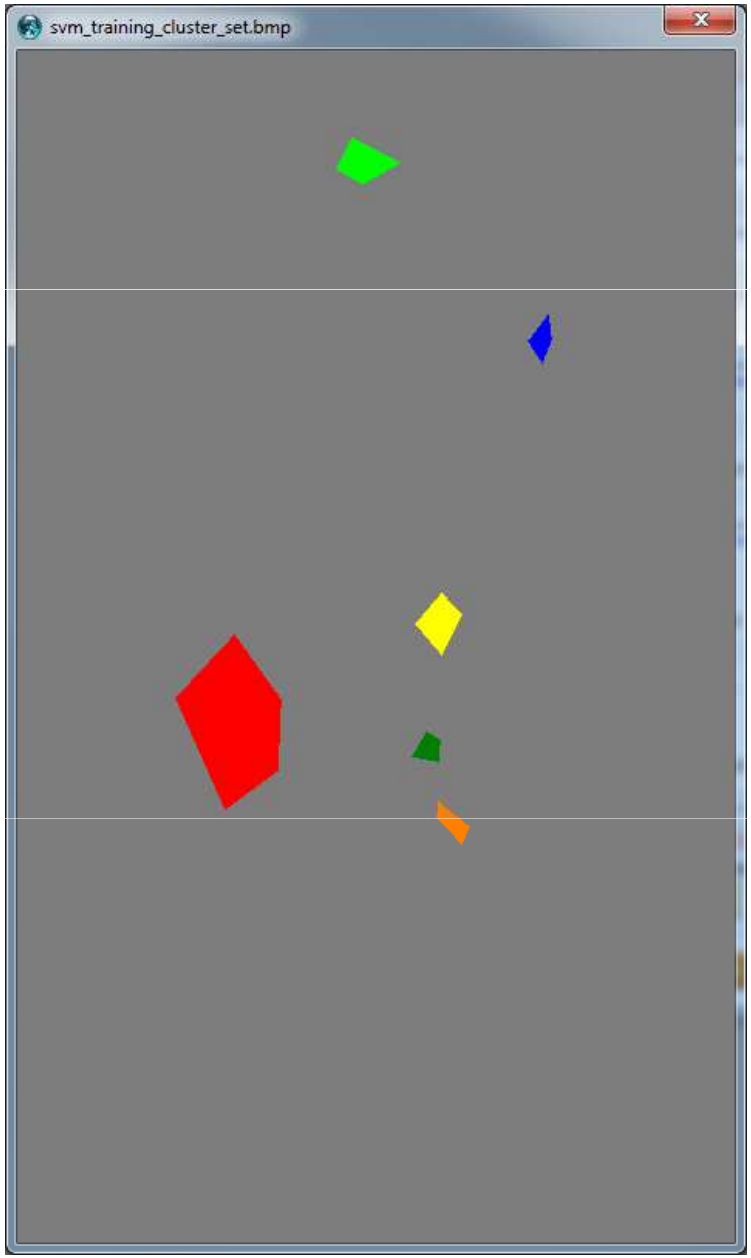


SUPPORT VECTOR MACHINE CLASSIFICATION



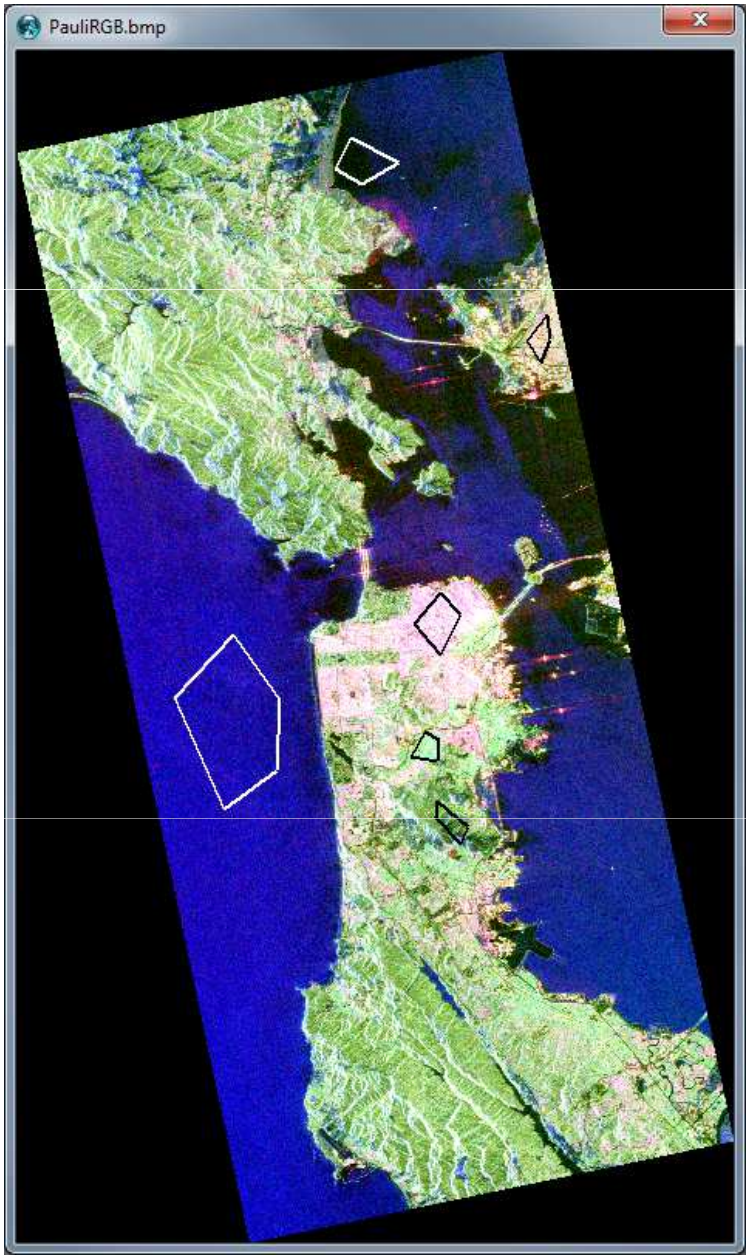
SUPPORT VECTOR MACHINE CLASSIFICATION

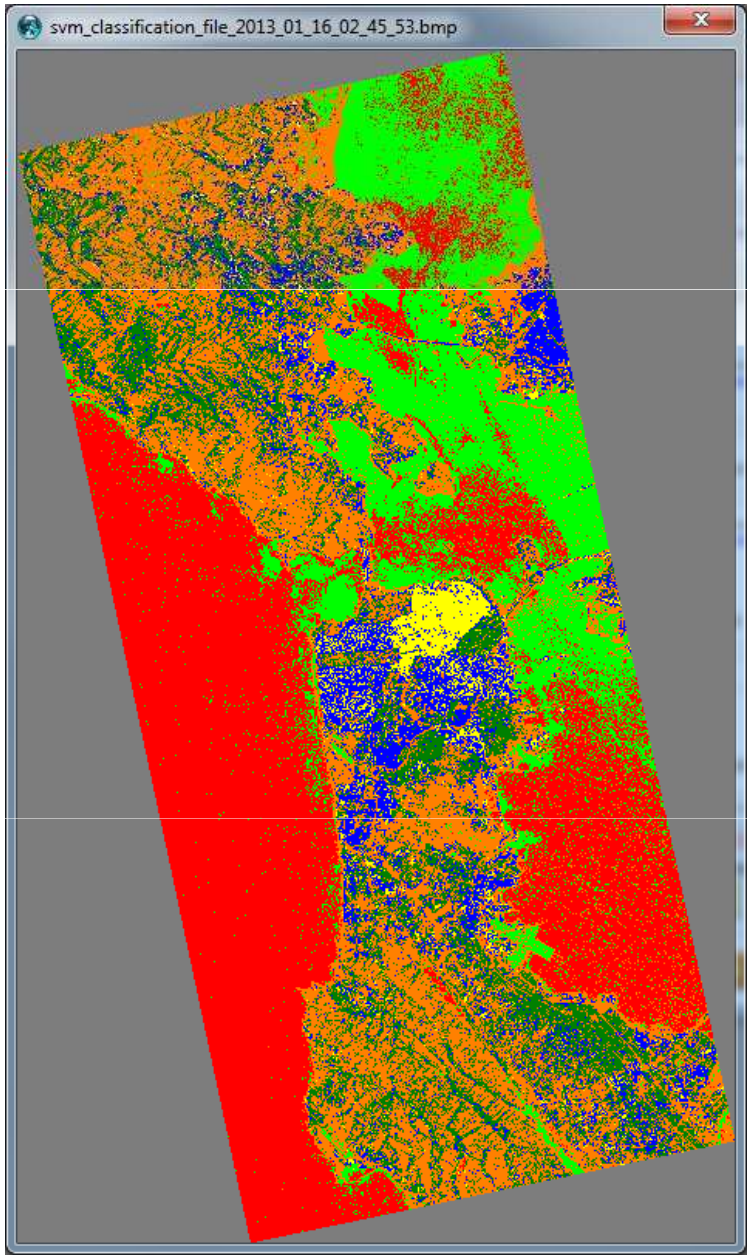




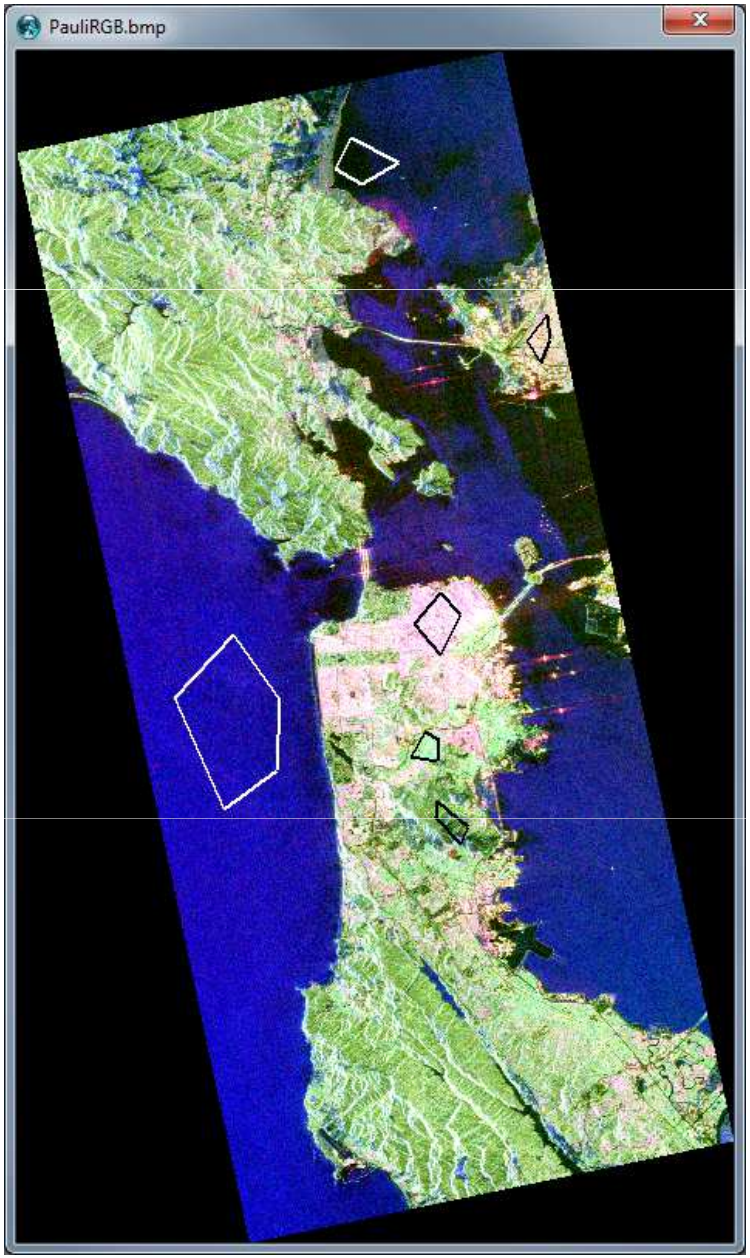
E. Pottier (2013)

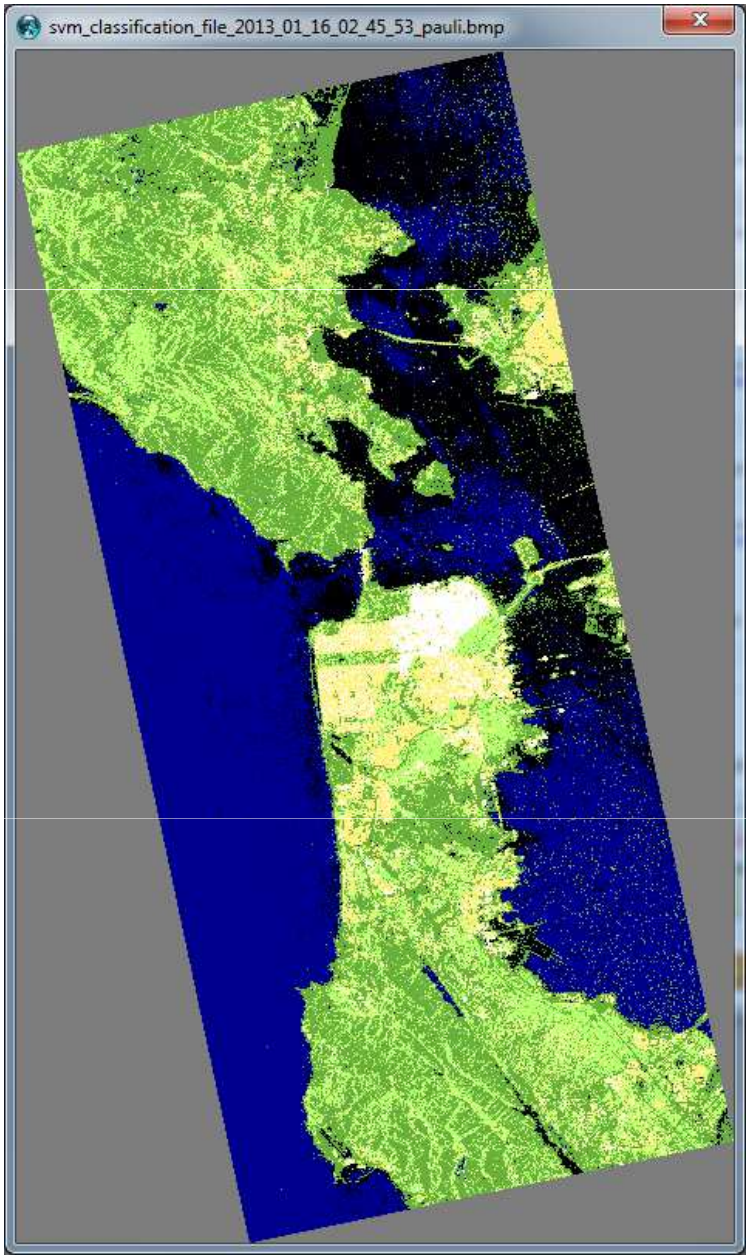
SUPPORT VECTOR MACHINE CLASSIFICATION





SUPPORT VECTOR MACHINE CLASSIFICATION





Questions ?